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REPORT

July 8, 2019



Stormwater Management Report

Prepared for:
The Bongiovanni Group

Site Location:
380 Tunxis Road
West Hartford, Connecticut

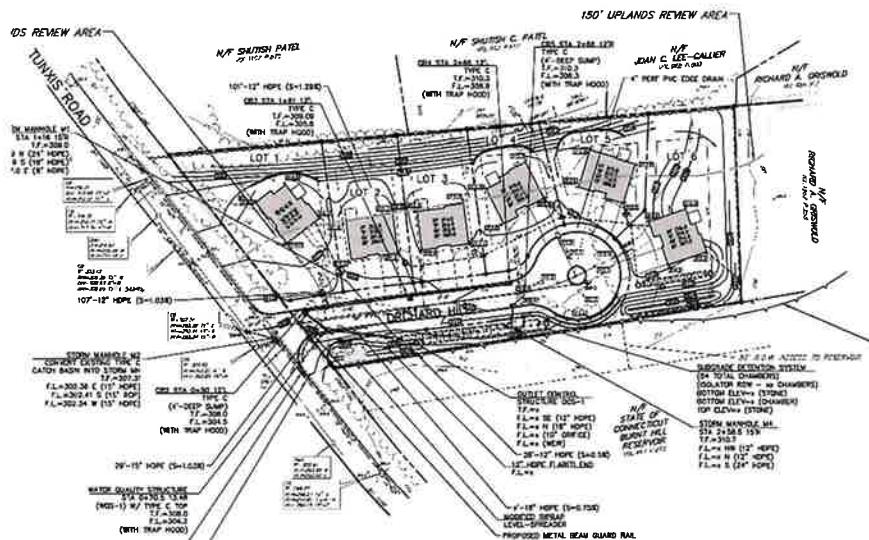


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1.0 INTRODUCTION

Weston & Sampson is pleased to submit this Stormwater Management Report on behalf of the applicant. A six (6) lot residential subdivision is proposed at 380 Tunxis Road in West Hartford, CT. The 2.6 Acre property is located on the north side of Tunxis Road and is bordered by the Farmington Town line/residential properties to the west, a residential property to the north, and a State-owned property associated with the Burnt Hill Reservoir to the east. Refer to the Location Plan in Appendix A.

A 400 linear foot public road and cul-de-sac is proposed to provide direct access from Tunxis Road to the residential properties. The site development will also include curbing, bituminous concrete driveways, landscaping, utilities, retaining walls, and a stormwater management system.

2.0 DESIGN METHODOLOGIES

All storm drainage has been designed in accordance with the State of Connecticut, Department of Transportation, Drainage Manual. The Rational Method was used for the development of peak flows for the storm sewer design while SCS Runoff (TR-55) was used for the detention design. Minimum times of concentration were 5 minutes for paved areas and 10 minutes for grassed areas. All other times of concentration were calculated using the TR-55 method. Precipitation records for each design storm are taken from NOAA Atlas 14, Volume 10, Version 2, Precipitation Frequency Data Server for West Hartford, CT. Refer to Appendix F for this information. Runoff coefficients of 0.3 (Lawns), and 0.9 (Pavement and Roofs) were used for the storm drainage design

The Hydraflow Storm Sewers program was used for the analysis of storm sewer pipe flow, gutter-flow, and hydraulic grade line. The roadway storm sewer system has been designed with the capacity necessary to convey the 10-year frequency design storm. The storm sewer system design can be found in Appendix C.

The Hydraflow Hydrographs program was used for pre-development and post-development analysis of the various drainage areas including the routing of hydrographs through the proposed subgrade detention system. This system has been designed with the capacity necessary to convey and control the 100-year frequency design storm. The Pre and Post-Development Hydrograph Analysis as well as the design of the proposed subgrade detention system pond can be found in Appendix B.

3.0 PRE-DEVELOPMENT SITE CONDITIONS

The existing property is mostly lawn with some wooded areas to the north and has an existing home with paved driveway.

The existing site is divided into three (3) pre-development drainage areas as follows (See Figures 1 and 2 in Appendix A):

Pre-Development A:

Runoff from the southern portion of site generally flows in a southeasterly direction to a Discharge Point located at an existing catch basin located on Tunxis Road.

Pre-Development B:

Runoff from the majority of the project site generally flows in an easterly direction to a Discharge Point located along the eastern property boundary. It is important to note that offsite runoff enters the 380 Tunxis Road property from the west and contributes to pre-development area "B".

Pre-Development C:

Runoff from the northern portion of the property generally flows in a northeasterly direction to a Discharge Point located along the northern property boundary. It is important to note that offsite runoff enters the 380 Tunxis Road property from the west and contributes to pre-development area "C".

A summary of the pre-development peak runoff rates can be seen in Table 1.

4.0 POST-DEVELOPMENT SITE CONDITIONS

The post-development watersheds have been divided into three (3) drainage areas for the purpose of comparing peak rates of runoff with that of pre-development, and can be seen in Figure 3 in Appendix A.

Roadway and front-yard site runoff will be controlled by a roadway storm drainage system consisting of Town Standard (Type C Top) catch basins and shall discharge to a plunge-pool level spreader prior to leaving the site. A second storm drainage system will capture the majority of remaining on-site and offsite runoff and shall discharge to a subgrade detention system. Prior to leaving the site, this runoff will discharge to a plunge-pool level spreader located at the northeast corner of the site. The majority of roof runoff will be captured by the proposed storm drainage systems while the remaining will be allowed to sheet flow overland. All proposed piping within the development (except for PVC roof leaders) is high density polyethylene (HDPE) and has been sized to control the 10-year design storm. The layout of the system along with pipe sizes and lengths, inverts, top of frames, etc. can be seen on the "Drainage Schematic" or Figure 5 in Appendix A. The storm sewer calculations, which includes pipe hydraulics, gutter-flow analysis, and hydraulic grade line analysis can be seen in the Hydraflow results presented in Appendix C.

The roadway drainage system shall have coarse sediment removal through the use of 2' and 4'-deep sumps catch basins. The primary means for stormwater treatment will be provided by water quality structure (WQS-1). This structure is designed to treat the majority of site runoff and is specified to be a hydrodynamic separator from the CTDOT list of approved products. The structure is capable of removing 80% of total suspended solids (TSS) as well as preventing migration of oils and other floatables. Refer to Appendix D for water quality flow (WQF) and bypass sizing calculations for the proposed water quality structure. A modified riprap splashpad will provide outlet protection while a turf reinforced level-spreader will further reduce discharge velocities and convert concentrated runoff to sheet-flow prior to discharging runoff to the adjacent wetlands to the east. These measures are

consistent with procedures indicated in the Connecticut Stormwater Quality Manual. It is anticipated that the combination of these structural BMP's will be most effective in controlling and eliminating sediment, oil and grease, leaves and grass clippings, and seasonally elevated runoff temperatures.

The second site drainage system will utilize a treatment train approach. Prior to entering the subgrade detention system, pre-treatment shall occur from the combined use of 2' and 4'-deep sumps catch basins. The first-flush (WQV) of site runoff shall also be directed through the detention system "isolator row". Refer to Appendix D for the associated Water Quality Volume (WQV) calculation. The isolator chamber row is wrapped in a non-woven geotextile, which is designed to capture any additional sediment that has not been captured in the upstream measures. The subgrade detention system is a chamber-type system surrounded by crushed stone and wrapped in filter fabric (See Figure 6 in Appendix A). The system has not been designed for infiltration and as an added factor of safety, will have a thermoplastic PVC liner on the bottom and sides to prevent lateral exfiltration. A proposed outlet control structure will release the detention system discharge at a reduce peak rate of runoff (See Figure 7 in Appendix A). Should the proposed orifices within the outlet control structure OCS-1 become clogged, the weir wall and 12" HDPE outlet pipe will pass the 100-year storm. This additional analysis has been provided in Appendix B. A modified riprap splashpad will provide outlet protection while a turf reinforced level-spreader will further reduce discharge velocities and convert concentrated runoff to sheet-flow prior to discharging runoff to the adjacent wetlands to the east. These measures are consistent with procedures indicated in the Connecticut Stormwater Quality Manual.

5.0 EROSION & SEDIMENTATION CONTROL MEASURES

In order to protect the adjacent properties and resource areas from construction related activities, a Soil Erosion and Sediment Control Plan has been developed in accordance with the latest Connecticut Guidelines for Soil Erosion and Sediment Control. This plan will be implemented prior to the start of any site disturbance and will involve the combined use of perimeter silt fencing, hay bale barriers, an anti-tracking pad, and vegetative stabilization. Refer to design plans for soil erosion and sediment control notes, construction sequence, and details.

Once a contractor has been selected and a construction schedule has been established a person shall be named and will be responsible for implementation of sediment and erosion control measures. This responsibility includes the acquisition of materials, installation, and maintenance of erosion and sediment structures, the communication and detailed explanation to all people involved in the site work of the requirements and objective of the erosion and sediment control measures.

Weston and Sampson (860) 616-6623 located at 273 Dividend Road, Rocky Hill, Connecticut, 06067 shall be notified of any proposed alteration to the erosion and sediment control plan, prior to altering, in order to ensure the feasibility of the addition, subtraction, or change in the plan.

An Operation and Maintenance Plan has been prepared for the proposed erosion and sediment control measures during the construction of the stormwater system. This plan shall be implemented at the onset and throughout construction activities until the project is complete. This plan provides guidelines for when the stormwater system should be cleaned, and associated record keeping and can be found in Appendix E.

6.0 SUMMARY

A Pre & Post Development analysis (Appendix B) has been performed to show that the total peak flow rate for the 2 thru 100-year design storms has not increased over that of pre-development. A summary of the pre and post-development peak flow rates for each Subarea is shown below in Table 1:

Table 1
Pre and Post-Development Peak Flows

Drainage Subareas	2-year, 24-hour storm		10-year, 24-hour storm		25-year, 24-hour storm		50-year, 24-hour storm		100-year, 24-hour storm	
	Peak Flow (cfs) (Pre)	Peak Flow (cfs) (Post)	Peak Flow (cfs) (Pre)	Peak Flow (cfs) (Post)	Peak Flow (cfs) (Pre)	Peak Flow (cfs) (Post)	Peak Flow (cfs) (Pre)	Peak Flow (cfs) (Post)	Peak Flow (cfs) (Pre)	Peak Flow (cfs) (Post)
A	0.70	0.55	1.72	1.32	2.42	1.81	2.97	2.20	3.54	2.60
B	2.14	2.27*	5.12	4.97*	7.13	6.90*	8.70	8.33*	10.31	10.86*
C	0.82	0.54	1.90	1.25	2.63	1.73	3.19	2.10	3.77	2.48
Total (Site)	3.66	3.24	8.74	7.16	12.18	10.01	14.87	12.20	17.61	14.39

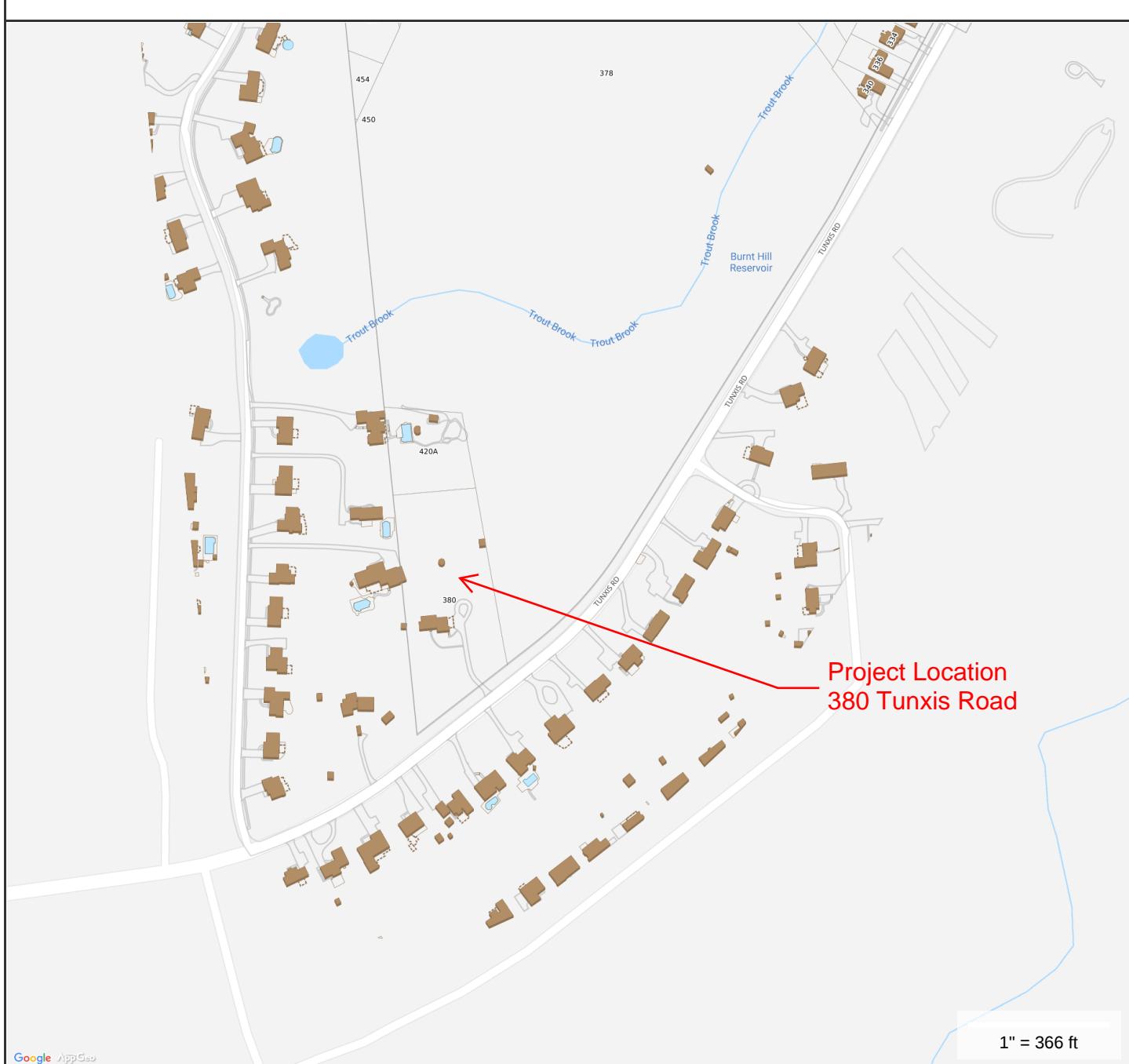
* Peak flow represents that which is reduced/mitigated as a result of subgrade detention (Post-Development Subarea B3)

It can be seen from the results in Table 1, that the proposed Stormwater Management System will effectively serve to mitigate the effects of the proposed site improvements. The total post-development peak flow for the various design storms is below that of pre-development.

APPENDIX A

Figures

Location Map



Google App Geo



**MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT**

Town of West Hartford, CT makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 8/1/2018
Data updated Daily

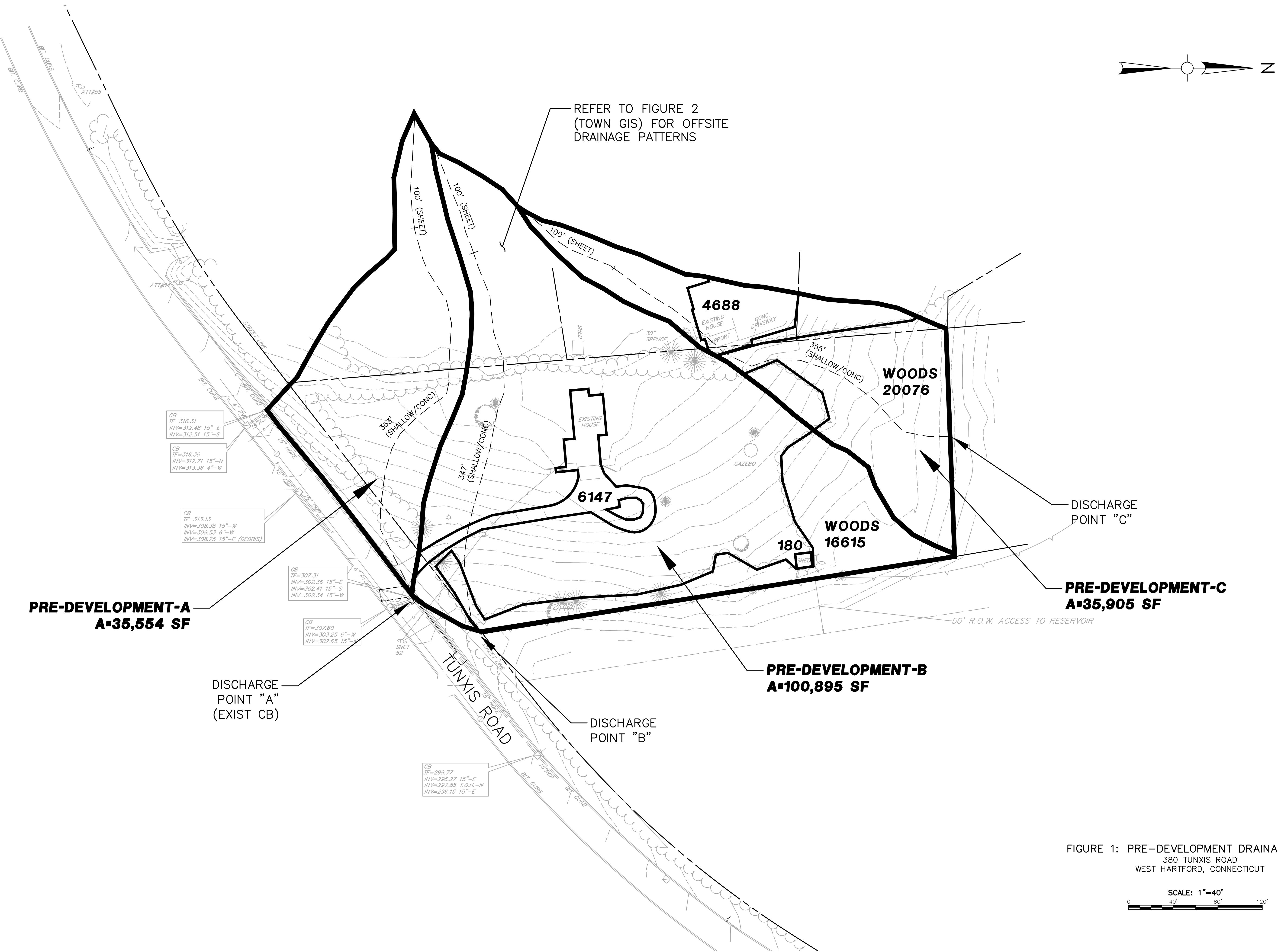


FIGURE 1: PRE-DEVELOPMENT DRAINAGE AREAS
380 TUNXIS ROAD
WEST HARTFORD, CONNECTICUT

SCALE: 1"=40'

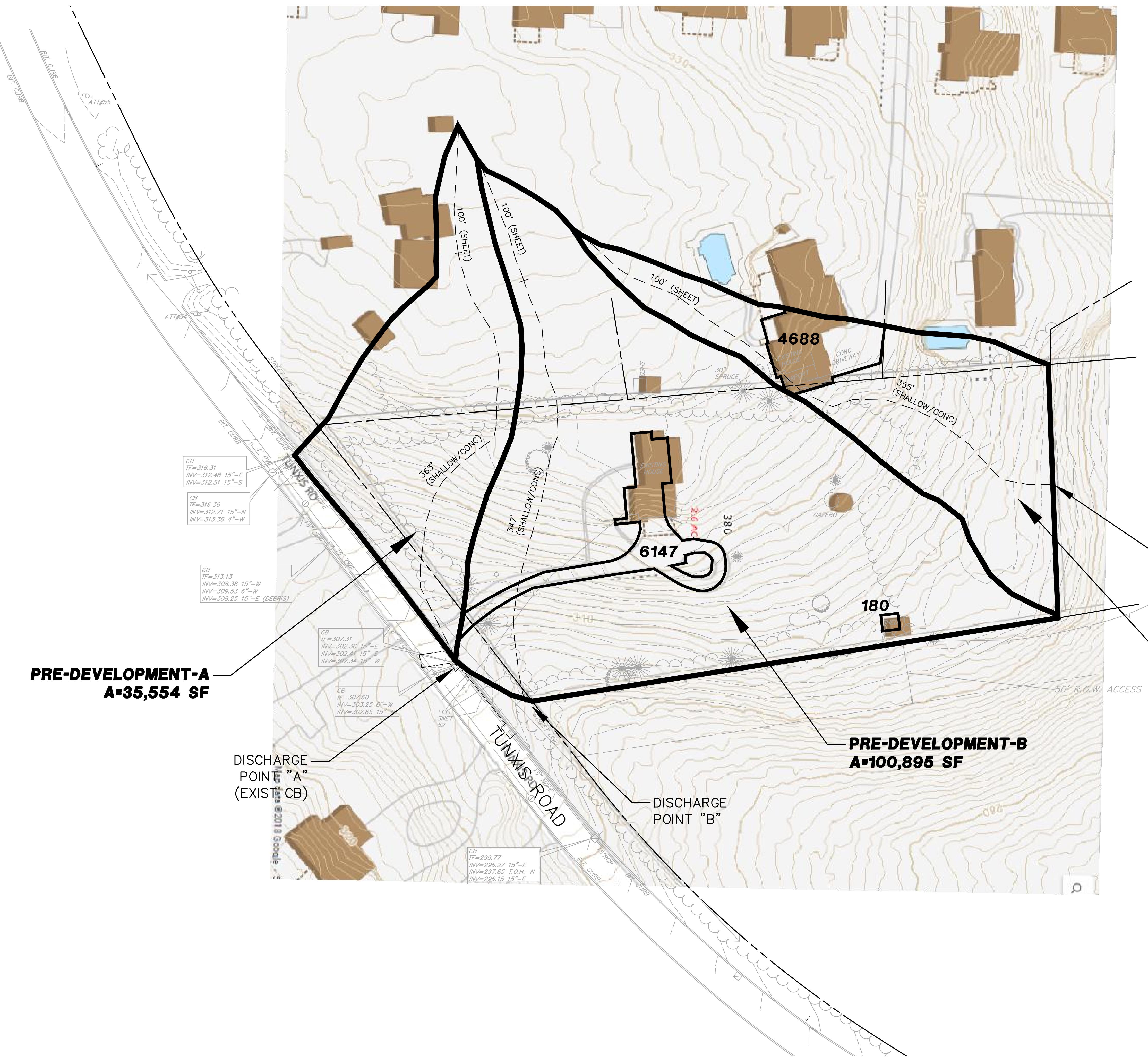


FIGURE 2: PRE-DEVELOPMENT DRAINAGE AREAS (OFFSITE)
380 TUNXIS ROAD
WEST HARTFORD, CONNECTICUT

NOTE: MAPPING SHOWING OFFSITE CONTOURS IS BASED ON TOPOGRAPHY TAKEN FROM ONLINE TOWN GIS MAPPING. THIS MAPPING IS APPROXIMATE AND ONLY USED FOR REFERENCE PURPOSES.

SCALE: 1"=40'

0 40' 80' 120'

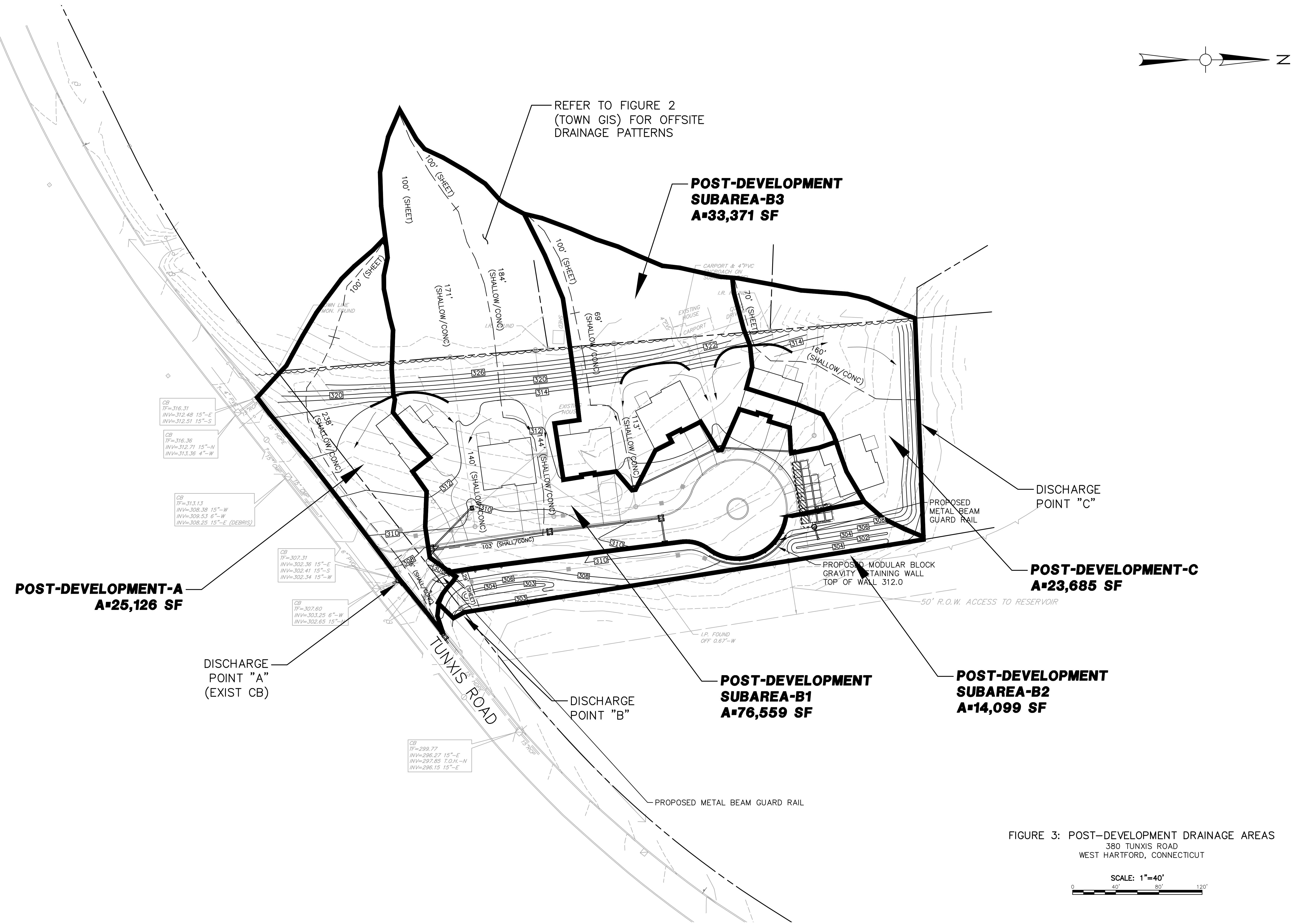


FIGURE 3: POST-DEVELOPMENT DRAINAGE AREAS
380 TUNXIS ROAD
WEST HARTFORD, CONNECTICUT

SCALE: 1"=40'

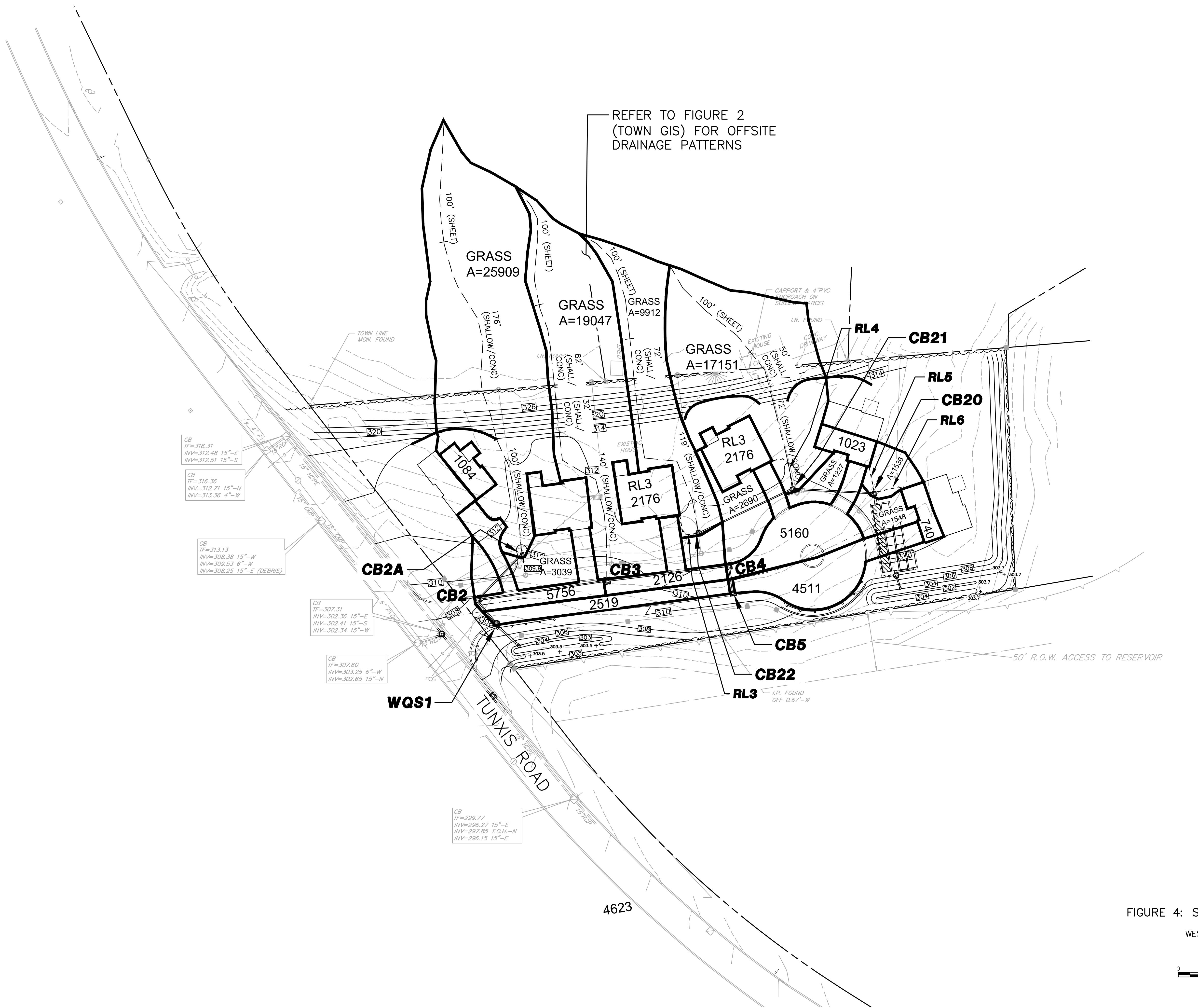


FIGURE 4: STORM SEWER DRAINAGE AREAS
380 TUNXIS ROAD
WEST HARTFORD, CONNECTICUT

SCALE: 1"=40'

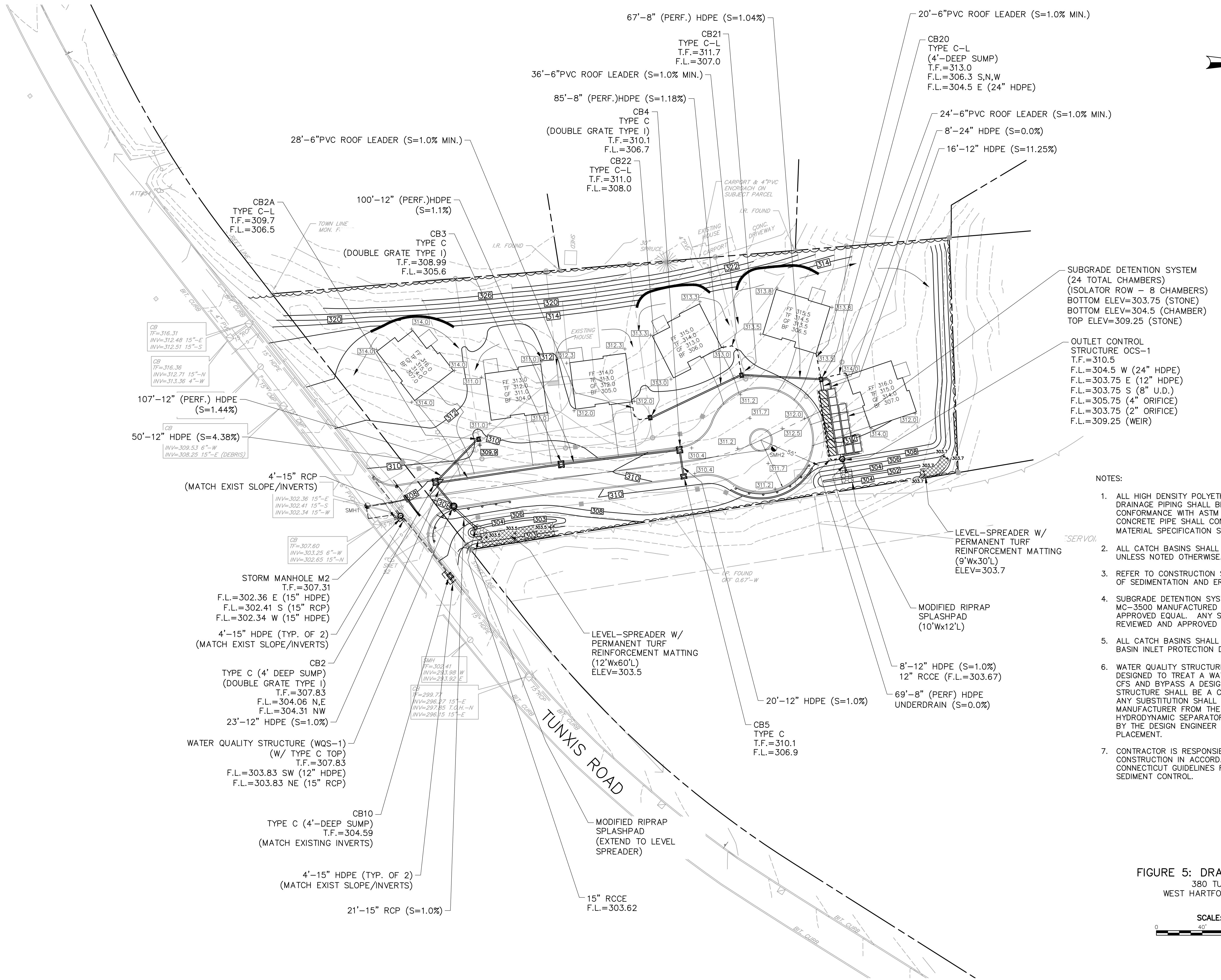


FIGURE 5: DRAINAGE SCHEMATIC
380 TUNXIS ROAD
WEST HARTFORD, CONNECTICUT

SCALE: 1"=40'
0 40' 80' 120'

STORMTECH
CHAMBER SCHEDULE

ROW #	NUMBER OF CHAMBERS PER ROW
1	8
2	8
3	6
4	2
TOTAL=	24

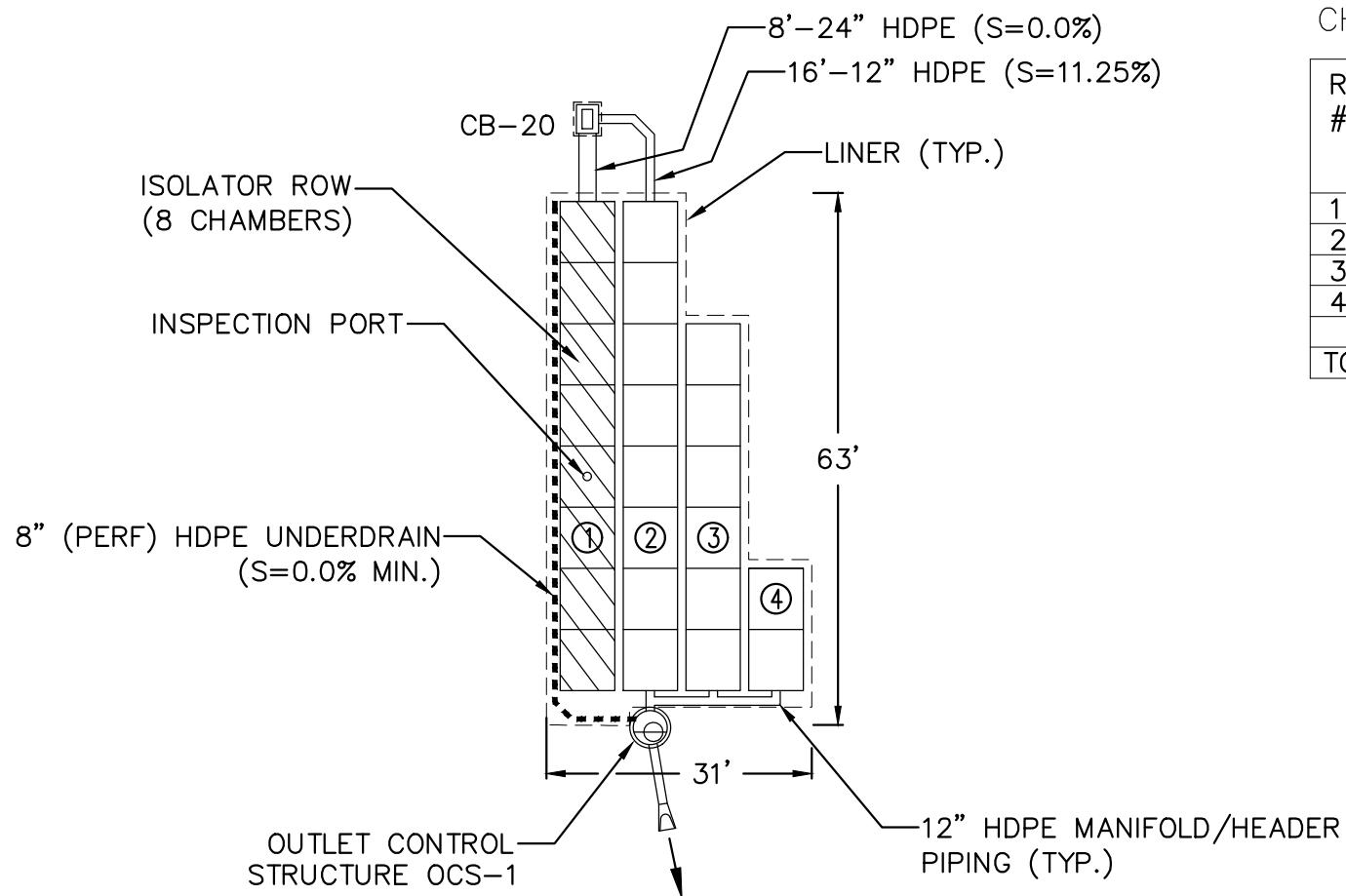


FIGURE 6: SUBGRADE DETENTION SYSTEM SCHEMATIC
N.T.S.

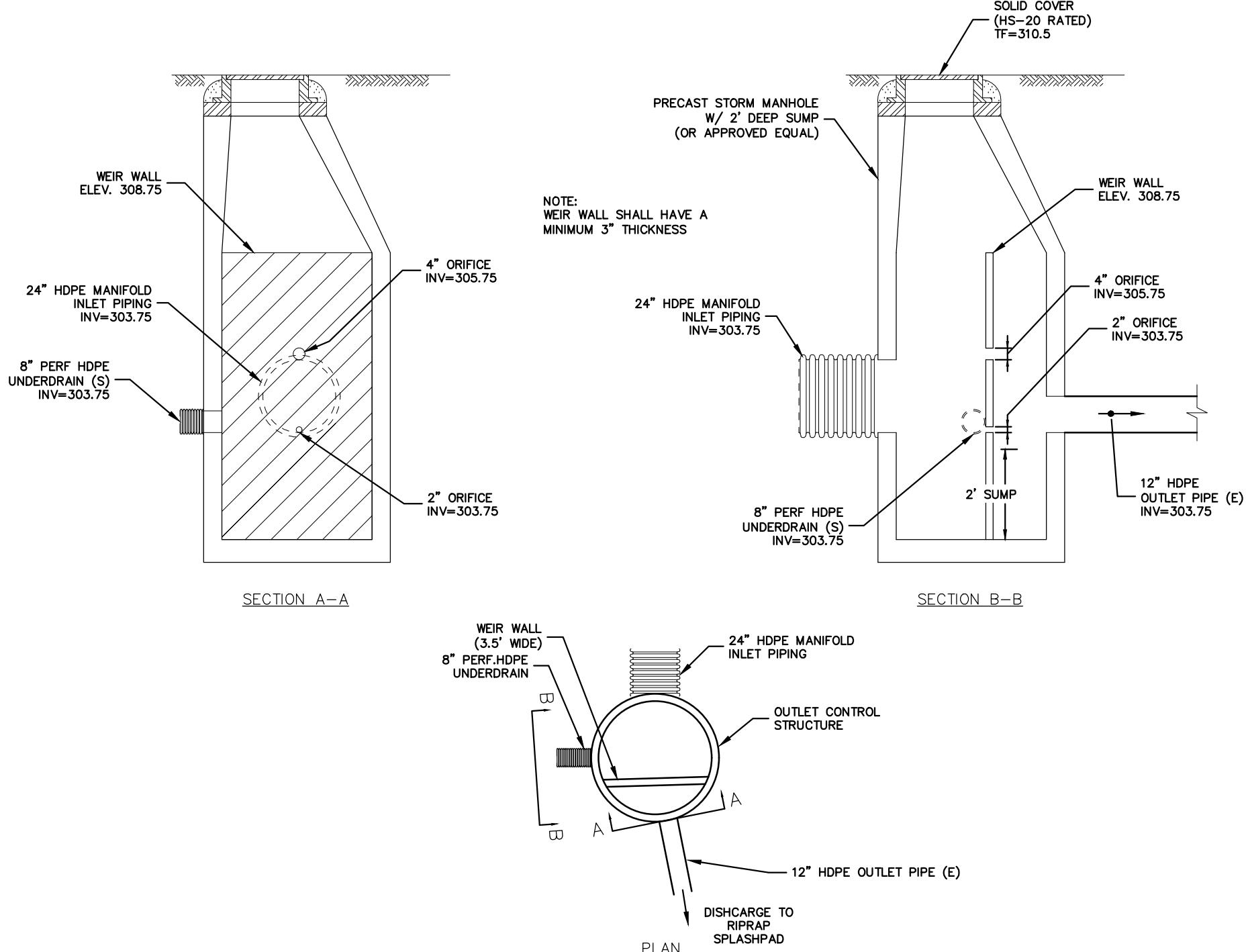


FIGURE 7: OUTLET CONTROL STRUCTURE (OCS-1) AND PIPING DETAIL
N.T.S

APPENDIX B

Pre and Post-Development Analysis (Detention System Design)

SUBJECT 380 Tunxis Rd
Pre and Post Development
JOB NO. 2180652



SHEET NO.	1	OF	1
COMPUTED BY	BH	DATE	12/10/2018
CHECKED BY	JSP	DATE	3/22/2019

DATA SHEET FOR TR-55 METHOD STORM DRAINAGE DESIGN

SUBJECT 380 Tunxis Rd
Post Development
JOB NO. 2180652



SHEET NO. 1 OF 1
COMPUTED BY JSP DATE 4/16/2019
CHECKED BY JSP DATE 4/16/2019

DATA SHEET FOR TR-55 METHOD STORM DRAINAGE DESIGN

NODE		AREA	RUNOFF CURVE NUMBER			TIME OF CONCENTRATION (TR-55)					
AREA I.D.	AREA (S.F.)	ACRES	DESCRIPTION	CN VALUE	TOTAL	ELEV. DIFF. FT	LENGTH FT	SLOPE %	COVER	TIME MIN.	Flow Type
POST	23156	0.532	GRASS	74	39.34	6	100	6.0	Grass	9.18	Sheet
DEVELOP	1970	0.045	IMPERVIOUS	98	4.43	23	238	9.7	Grass	0.78	Shallow
A						3	76	3.9	Impv	0.31	Shallow
						(Tc Calculation from Hydraulflow)				10.3	(Total)
TOTAL	25126	0.577		75.9							
POST	55294	1.269	GRASS	74	93.93	1.5	100	1.5	Grass	16	Sheet
DEVELOP	21265	0.488	IMPERVIOUS	98	47.84	24	184	13.0	Grass	0.53	Shallow
B1						4	144	2.8	Grass	0.89	Shallow
						1.2	103	1.2	Impv	0.77	Shallow
TOTAL	76559	1.758		80.7		(Tc Calculation from Hydraulflow)				18.2	(Total)
POST	14099	0.324	GRASS	74	23.95	Use minimum for grass)=				10	
DEVELOP	0	0.000	IMPERVIOUS	98	0.00						
B2											
TOTAL	14099	0.324		74.0							
POST	27256	0.626	GRASS	74	46.30	4	100	4.0	Grass	10.8	Sheet
DEVELOP	6115	0.140	IMPERVIOUS	98	13.76	22	69	31.9	Grass	0.13	Shallow
B3						2.5	113	2.2	Grass	0.83	Shallow
TOTAL	33371	0.766		78.4		(Tc Calculation from Hydraulflow)				11.8	(Total)
POST	21093	0.484	GRASS	74	35.83	Use minimum for grass)=				10	
DEVELOP	2592	0.060	IMPERVIOUS	98	5.83						
C											
TOTAL	23685	0.544		76.6							

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Pre_Post_Tunxis Rd_R4.gpw

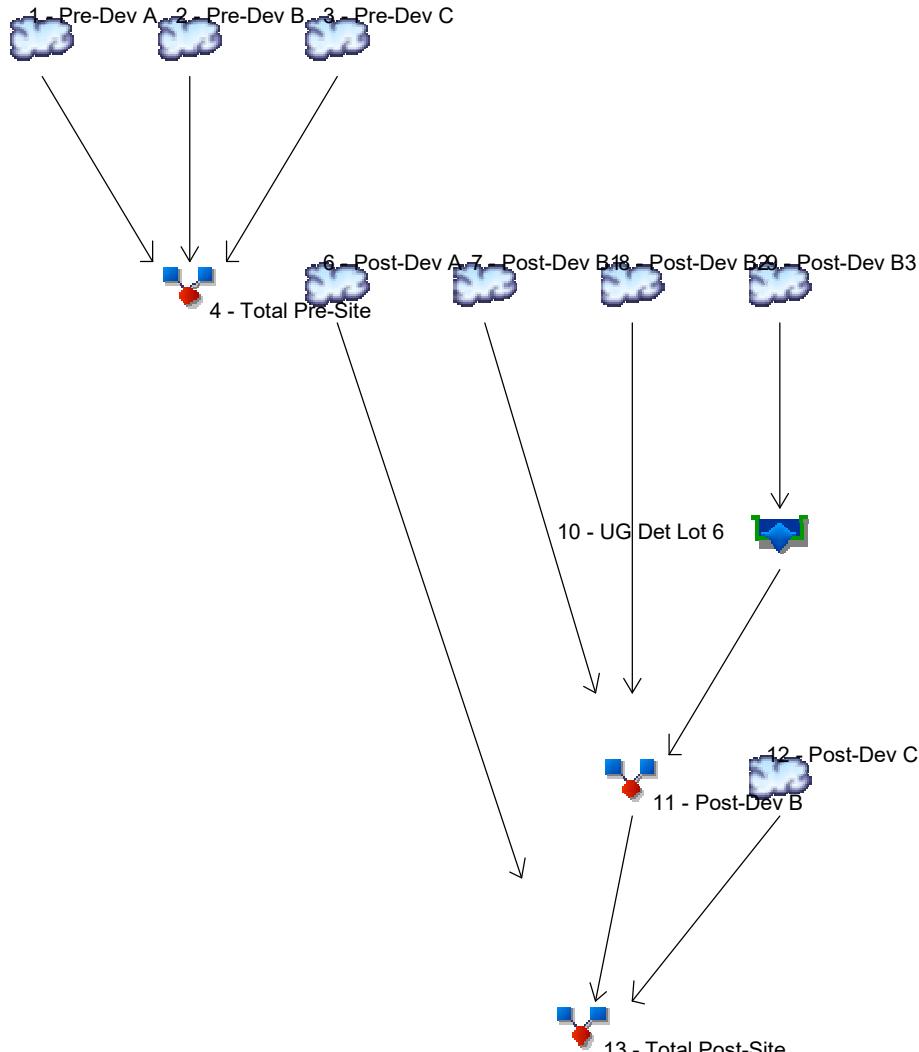
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

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Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019



Legend

Hyd. Origin Description

1	SCS Runoff	Pre-Dev A
2	SCS Runoff	Pre-Dev B
3	SCS Runoff	Pre-Dev C
4	Combine	Total Pre-Site
6	SCS Runoff	Post-Dev A
7	SCS Runoff	Post-Dev B1
8	SCS Runoff	Post-Dev B2
9	SCS Runoff	Post-Dev B3
10	Reservoir	UG Det Lot 6
11	Combine	Post-Dev B
12	SCS Runoff	Post-Dev C
13	Combine	Total Post-Site

Hydrograph Return Period Recap

Hydratow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	----	-----	0.696	-----	-----	1.722	2.422	2.973	3.537	Pre-Dev A
2	SCS Runoff	----	-----	2.141	-----	-----	5.119	7.129	8.704	10.31	Pre-Dev B
3	SCS Runoff	----	-----	0.822	-----	-----	1.904	2.626	3.190	3.765	Pre-Dev C
4	Combine	1, 2, 3	-----	3.659	-----	-----	8.744	12.18	14.87	17.61	Total Pre-Site
6	SCS Runoff	----	-----	0.553	-----	-----	1.302	1.805	2.199	2.600	Post-Dev A
7	SCS Runoff	----	-----	1.916	-----	-----	4.086	5.498	6.589	7.695	Post-Dev B1
8	SCS Runoff	----	-----	0.276	-----	-----	0.684	0.962	1.180	1.404	Post-Dev B2
9	SCS Runoff	----	-----	0.845	-----	-----	1.876	2.555	3.083	3.619	Post-Dev B3
10	Reservoir	9	-----	0.122	-----	-----	0.506	0.732	0.923	2.783	UG Det Lot 6
11	Combine	7, 8, 10	-----	2.268	-----	-----	4.967	6.901	8.327	10.86	Post-Dev B
12	SCS Runoff	----	-----	0.537	-----	-----	1.248	1.725	2.097	2.476	Post-Dev C
13	Combine	6, 11, 12	-----	3.237	-----	-----	7.161	10.01	12.20	14.39	Total Post-Site

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.696	5	730	2,899	----	----	----	Pre-Dev A
2	SCS Runoff	2.141	5	730	8,812	----	----	----	Pre-Dev B
3	SCS Runoff	0.822	5	730	3,350	----	----	----	Pre-Dev C
4	Combine	3.659	5	730	15,061	1, 2, 3	----	----	Total Pre-Site
6	SCS Runoff	0.553	5	730	2,264	----	----	----	Post-Dev A
7	SCS Runoff	1.916	5	735	9,295	----	----	----	Post-Dev B1
8	SCS Runoff	0.276	5	730	1,151	----	----	----	Post-Dev B2
9	SCS Runoff	0.845	5	730	3,404	----	----	----	Post-Dev B3
10	Reservoir	0.122	5	785	3,397	9	305.27	1,387	UG Det Lot 6
11	Combine	2.268	5	735	13,843	7, 8, 10	----	----	Post-Dev B
12	SCS Runoff	0.537	5	730	2,190	----	----	----	Post-Dev C
13	Combine	3.237	5	735	18,297	6, 11, 12	----	----	Total Post-Site
Pre_Post_Tunxis Rd_R4.gpw				Return Period: 2 Year				Monday, 07 / 1 / 2019	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.722	5	730	6,855	----	----	----	Pre-Dev A
2	SCS Runoff	5.119	5	730	20,345	----	----	----	Pre-Dev B
3	SCS Runoff	1.904	5	730	7,561	----	----	----	Pre-Dev C
4	Combine	8.744	5	730	34,761	1, 2, 3	----	----	Total Pre-Site
6	SCS Runoff	1.302	5	730	5,172	----	----	----	Post-Dev A
7	SCS Runoff	4.086	5	735	19,605	----	----	----	Post-Dev B1
8	SCS Runoff	0.684	5	730	2,722	----	----	----	Post-Dev B2
9	SCS Runoff	1.876	5	730	7,452	----	----	----	Post-Dev B3
10	Reservoir	0.506	5	755	7,445	9	306.58	2,952	UG Det Lot 6
11	Combine	4.967	5	735	29,772	7, 8, 10	----	----	Post-Dev B
12	SCS Runoff	1.248	5	730	4,959	----	----	----	Post-Dev C
13	Combine	7.161	5	735	39,904	6, 11, 12	----	----	Total Post-Site
Pre_Post_Tunxis Rd_R4.gpw				Return Period: 10 Year				Monday, 07 / 1 / 2019	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.422	5	730	9,620	----	----	----	Pre-Dev A
2	SCS Runoff	7.129	5	730	28,338	----	----	----	Pre-Dev B
3	SCS Runoff	2.626	5	730	10,453	----	----	----	Pre-Dev C
4	Combine	12.18	5	730	48,411	1, 2, 3	----	----	Total Pre-Site
6	SCS Runoff	1.805	5	730	7,180	----	----	----	Post-Dev A
7	SCS Runoff	5.498	5	735	26,509	----	----	----	Post-Dev B1
8	SCS Runoff	0.962	5	730	3,820	----	----	----	Post-Dev B2
9	SCS Runoff	2.555	5	730	10,201	----	----	----	Post-Dev B3
10	Reservoir	0.732	5	755	10,194	9	307.58	4,004	UG Det Lot 6
11	Combine	6.901	5	735	40,523	7, 8, 10	----	----	Post-Dev B
12	SCS Runoff	1.725	5	730	6,863	----	----	----	Post-Dev C
13	Combine	10.01	5	730	54,566	6, 11, 12	----	----	Total Post-Site
Pre_Post_Tunxis Rd_R4.gpw				Return Period: 25 Year				Monday, 07 / 1 / 2019	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.973	5	730	11,832	----	----	----	Pre-Dev A
2	SCS Runoff	8.704	5	730	34,706	----	----	----	Pre-Dev B
3	SCS Runoff	3.190	5	730	12,750	----	----	----	Pre-Dev C
4	Combine	14.87	5	730	59,289	1, 2, 3	----	----	Total Pre-Site
6	SCS Runoff	2.199	5	730	8,776	----	----	----	Post-Dev A
7	SCS Runoff	6.589	5	735	31,935	----	----	----	Post-Dev B1
8	SCS Runoff	1.180	5	730	4,698	----	----	----	Post-Dev B2
9	SCS Runoff	3.083	5	730	12,374	----	----	----	Post-Dev B3
10	Reservoir	0.923	5	755	12,367	9	308.74	4,846	UG Det Lot 6
11	Combine	8.327	5	735	49,000	7, 8, 10	----	----	Post-Dev B
12	SCS Runoff	2.097	5	730	8,377	----	----	----	Post-Dev C
13	Combine	12.20	5	730	66,153	6, 11, 12	----	----	Total Post-Site
Pre_Post_Tunxis Rd_R4.gpw				Return Period: 50 Year				Monday, 07 / 1 / 2019	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.537	5	730	14,126	----	----	----	Pre-Dev A
2	SCS Runoff	10.31	5	730	41,297	----	----	----	Pre-Dev B
3	SCS Runoff	3.765	5	730	15,122	----	----	----	Pre-Dev C
4	Combine	17.61	5	730	70,545	1, 2, 3	----	----	Total Pre-Site
6	SCS Runoff	2.600	5	730	10,427	----	----	----	Post-Dev A
7	SCS Runoff	7.695	5	735	37,503	----	----	----	Post-Dev B1
8	SCS Runoff	1.404	5	730	5,609	----	----	----	Post-Dev B2
9	SCS Runoff	3.619	5	730	14,611	----	----	----	Post-Dev B3
10	Reservoir	2.783	5	740	14,604	9	309.17	5,033	UG Det Lot 6
11	Combine	10.86	5	740	57,716	7, 8, 10	----	----	Post-Dev B
12	SCS Runoff	2.476	5	730	9,940	----	----	----	Post-Dev C
13	Combine	14.39	5	730	78,083	6, 11, 12	----	----	Total Post-Site
Pre_Post_Tunxis Rd_R4.gpw				Return Period: 100 Year				Monday, 07 / 1 / 2019	

Hydraflow Table of Contents

Pre_Post_Tunxis Rd_R4.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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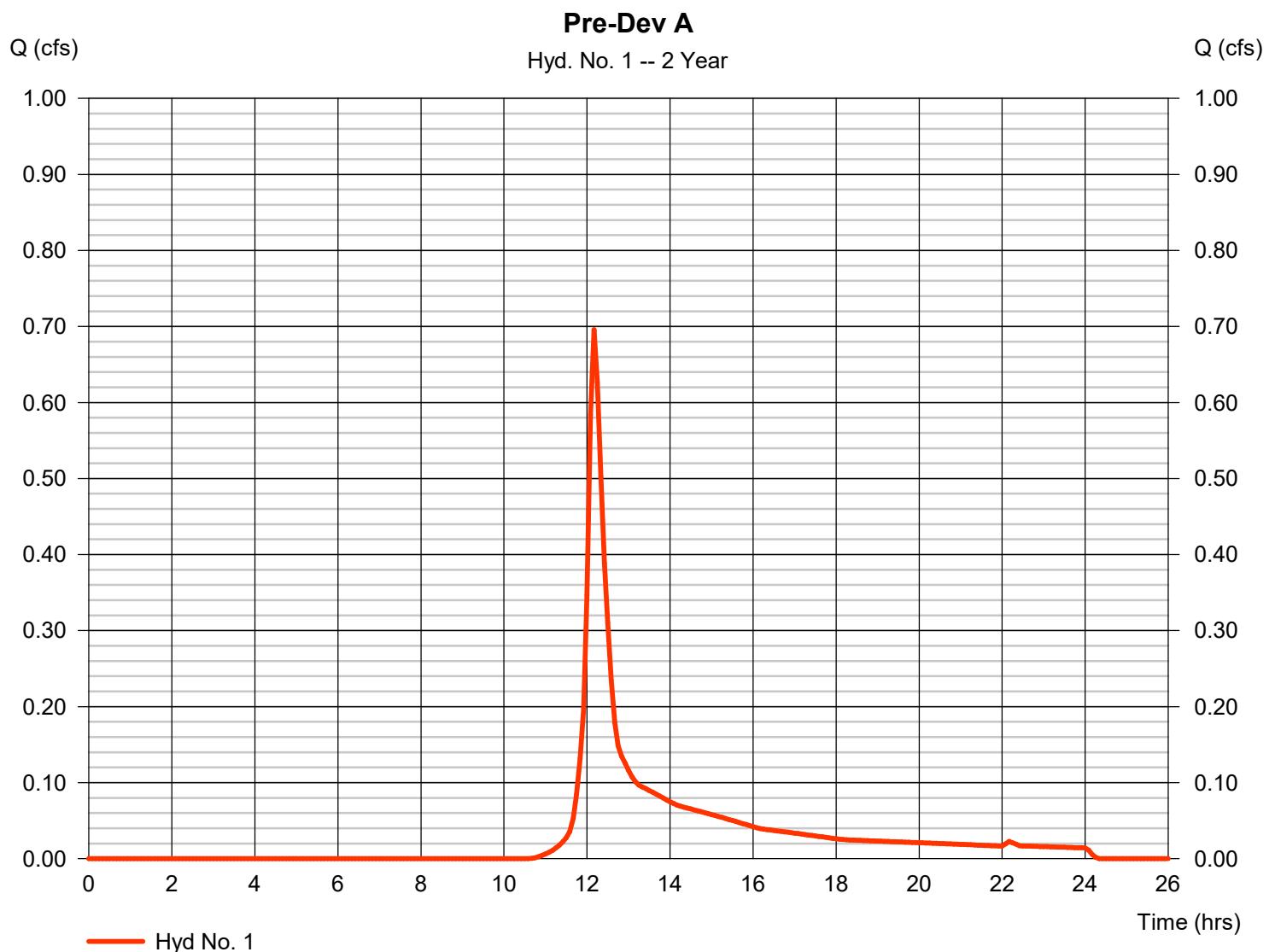
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Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.696 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 2,899 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 1

Pre-Dev A

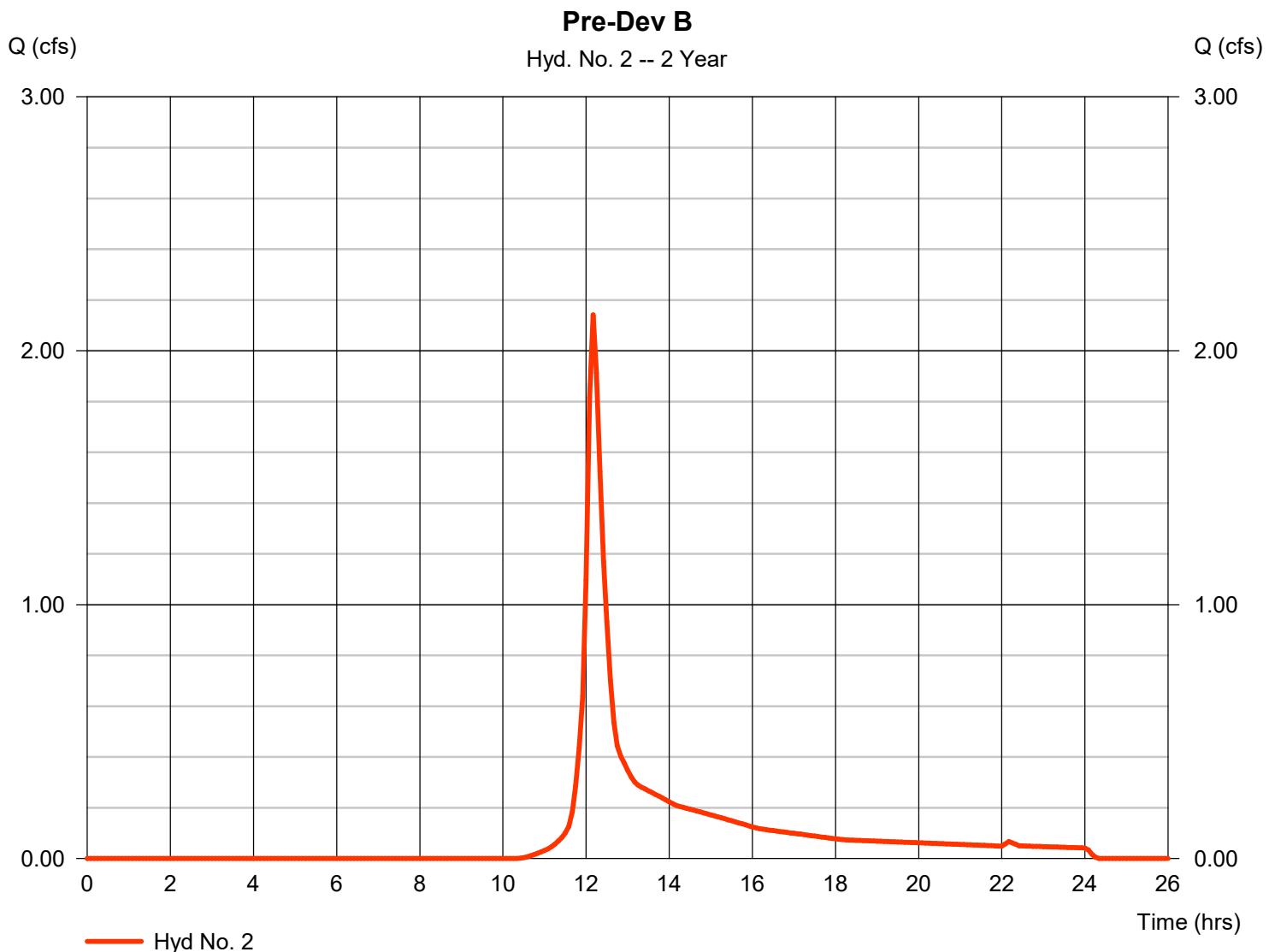
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	= 14.25	+ 0.00	+ 0.00	= 14.25
Shallow Concentrated Flow				
Flow length (ft)	= 363.00	0.00	0.00	
Watercourse slope (%)	= 11.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 5.35	0.00	0.00	
Travel Time (min)	= 1.13	+ 0.00	+ 0.00	= 1.13
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	({0}) 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				15.40 min

Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 2.141 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 8,812 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 2

Pre-Dev B

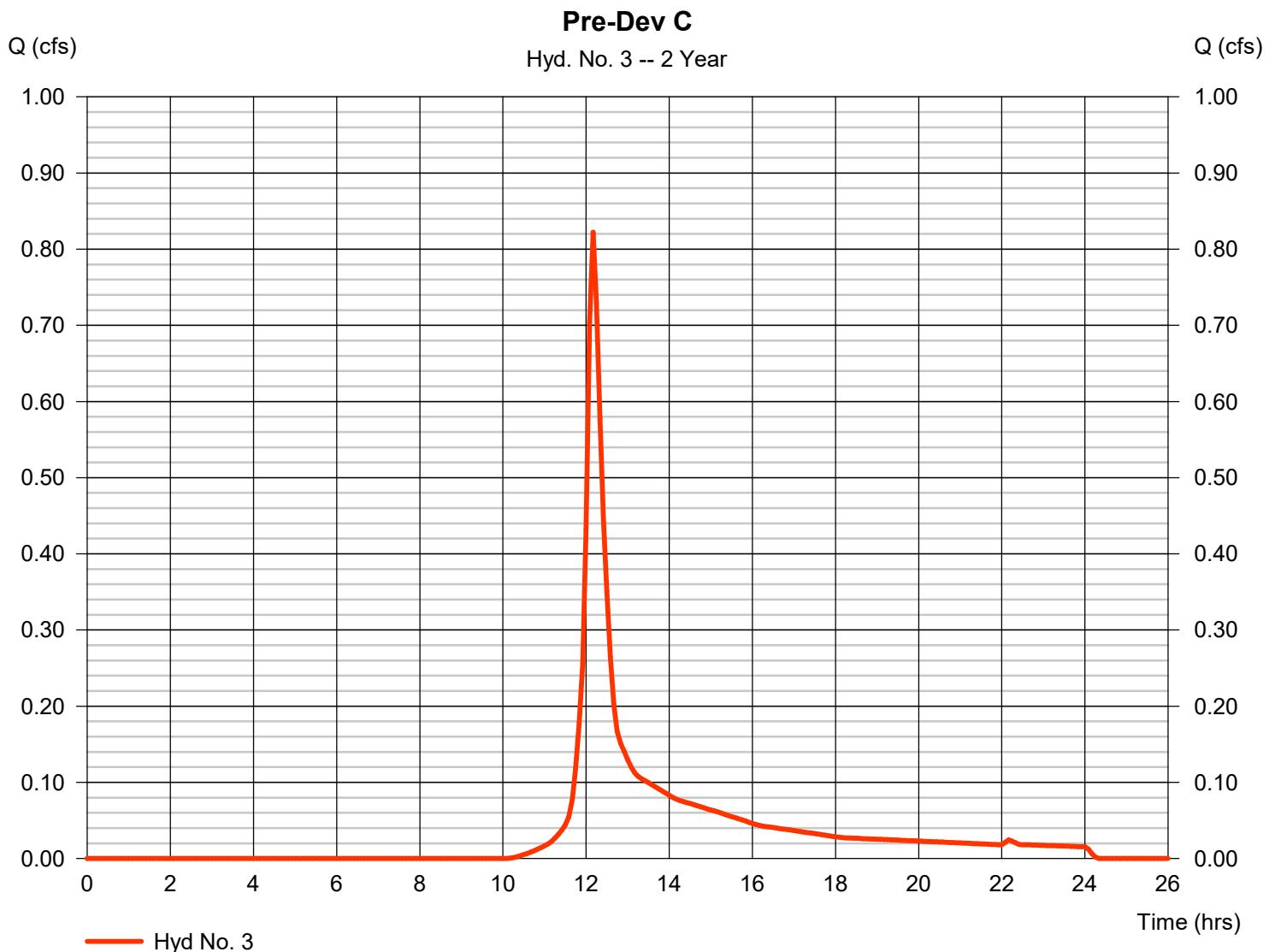
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00	
Land slope (%)	= 3.00	0.00	0.00	
Travel Time (min)	= 12.11	+ 0.00	+ 0.00	= 12.11
Shallow Concentrated Flow				
Flow length (ft)	= 347.00	0.00	0.00	
Watercourse slope (%)	= 9.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 4.84	0.00	0.00	
Travel Time (min)	= 1.19	+ 0.00	+ 0.00	= 1.19
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	({0}) 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				13.30 min

Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.822 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 3,350 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 3

Pre-Dev C

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00	
Land slope (%)	= 4.00	0.00	0.00	
Travel Time (min)	= 10.80	+ 0.00	+ 0.00	= 10.80
Shallow Concentrated Flow				
Flow length (ft)	= 355.00	0.00	0.00	
Watercourse slope (%)	= 31.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 8.98	0.00	0.00	
Travel Time (min)	= 0.66	+ 0.00	+ 0.00	= 0.66
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	({0}) 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				11.50 min

Hydrograph Report

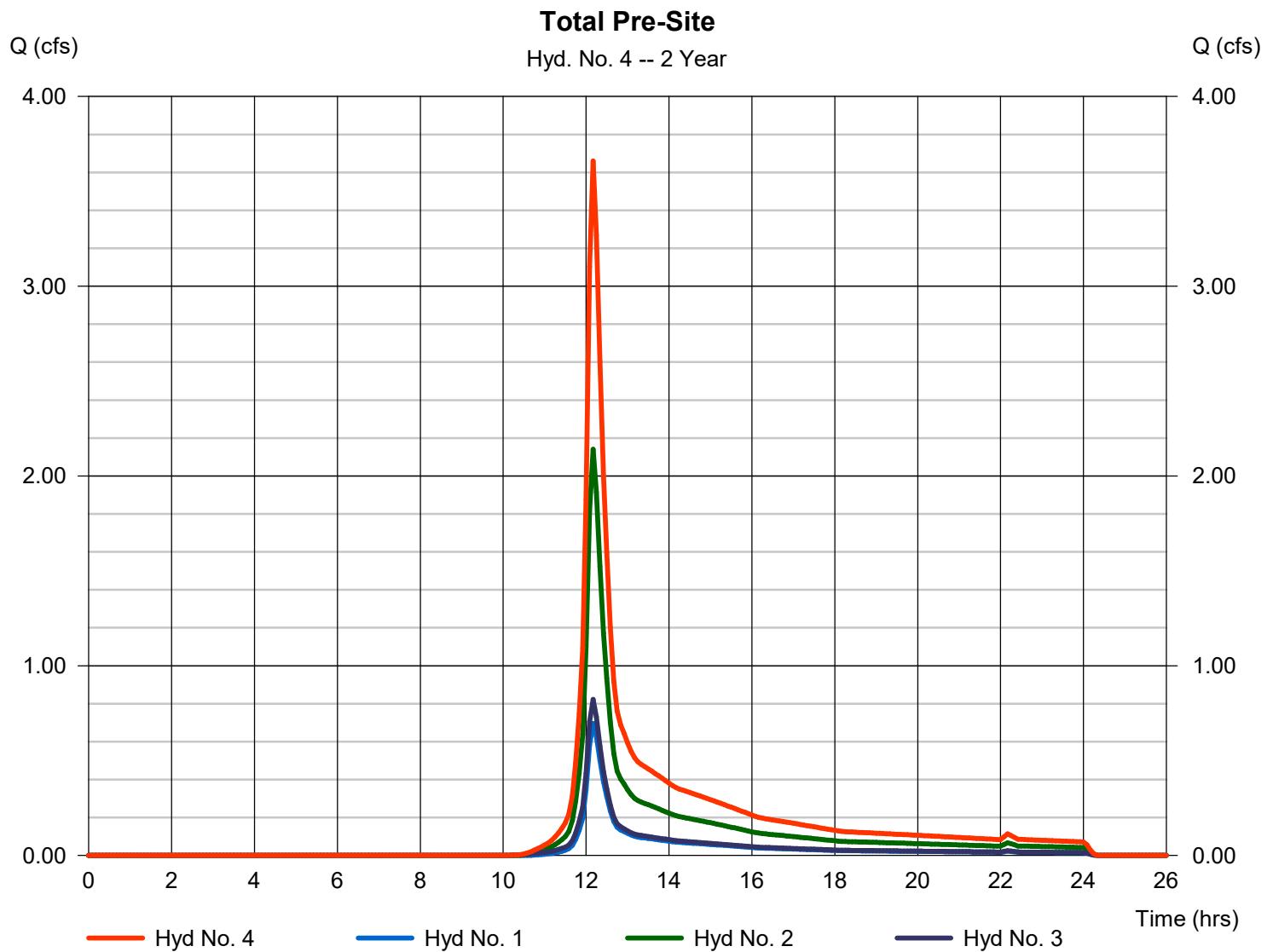
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 3.659 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 15,061 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac

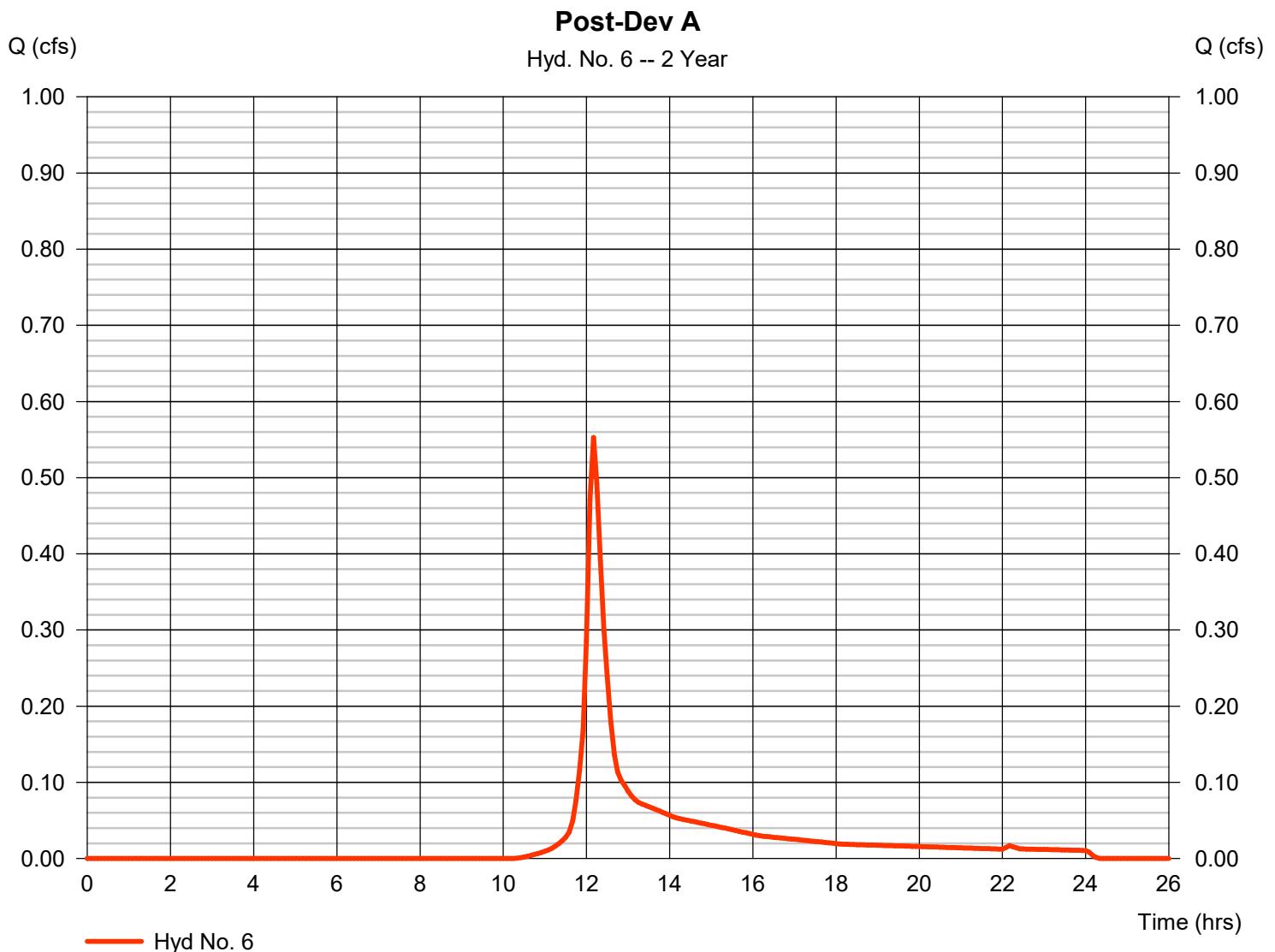


Hydrograph Report

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.553 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 2,264 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 6

Post-Dev A

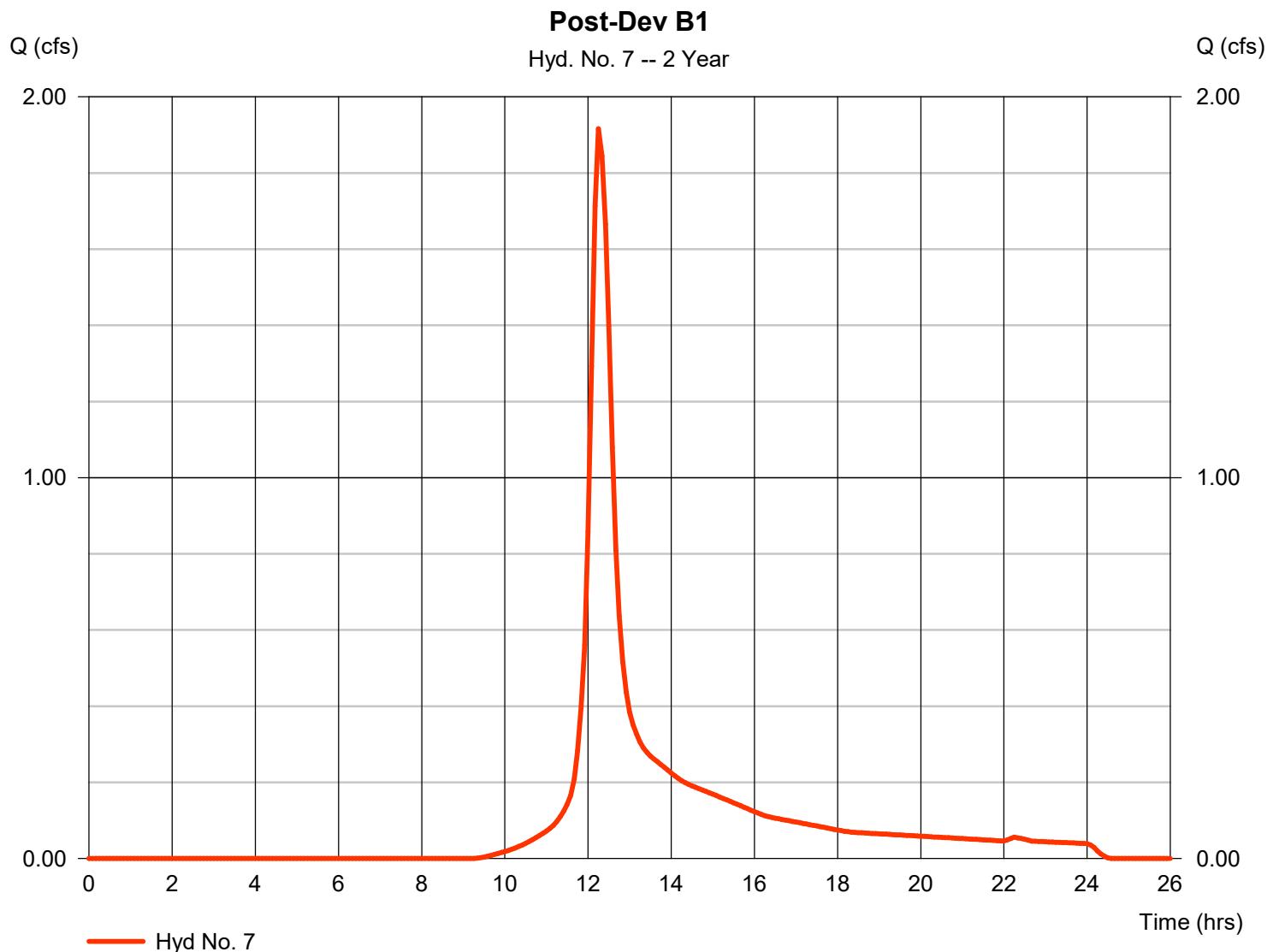
<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>	
Sheet Flow					
Manning's n-value	= 0.240	0.011	0.011		
Flow length (ft)	= 100.0	0.0	0.0		
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00		
Land slope (%)	= 6.00	0.00	0.00		
Travel Time (min)	= 9.18	+ 0.00	+ 0.00	=	9.18
Shallow Concentrated Flow					
Flow length (ft)	= 238.00	76.00	0.00		
Watercourse slope (%)	= 10.00	4.00	0.00		
Surface description	= Unpaved	Paved	Paved		
Average velocity (ft/s)	= 5.10	4.07	0.00		
Travel Time (min)	= 0.78	+ 0.31	+ 0.00	=	1.09
Channel Flow					
X sectional flow area (sqft)	= 0.00	0.00	0.00		
Wetted perimeter (ft)	= 0.00	0.00	0.00		
Channel slope (%)	= 0.00	0.00	0.00		
Manning's n-value	= 0.015	0.015	0.015		
Velocity (ft/s)	= 0.00	0.00	0.00		
Flow length (ft)	({0}) 0.0	0.0	0.0		
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	=	0.00
Total Travel Time, Tc					10.30 min

Hydrograph Report

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.916 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 9,295 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 7

Post-Dev B1

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00	
Land slope (%)	= 1.50	0.00	0.00	
Travel Time (min)	= 15.99	+ 0.00	+ 0.00	= 15.99
Shallow Concentrated Flow				
Flow length (ft)	= 184.00	144.00	103.00	
Watercourse slope (%)	= 13.00	2.80	1.20	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 5.82	2.70	2.23	
Travel Time (min)	= 0.53	+ 0.89	+ 0.77	= 2.19
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	({0}) 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				18.20 min

Hydrograph Report

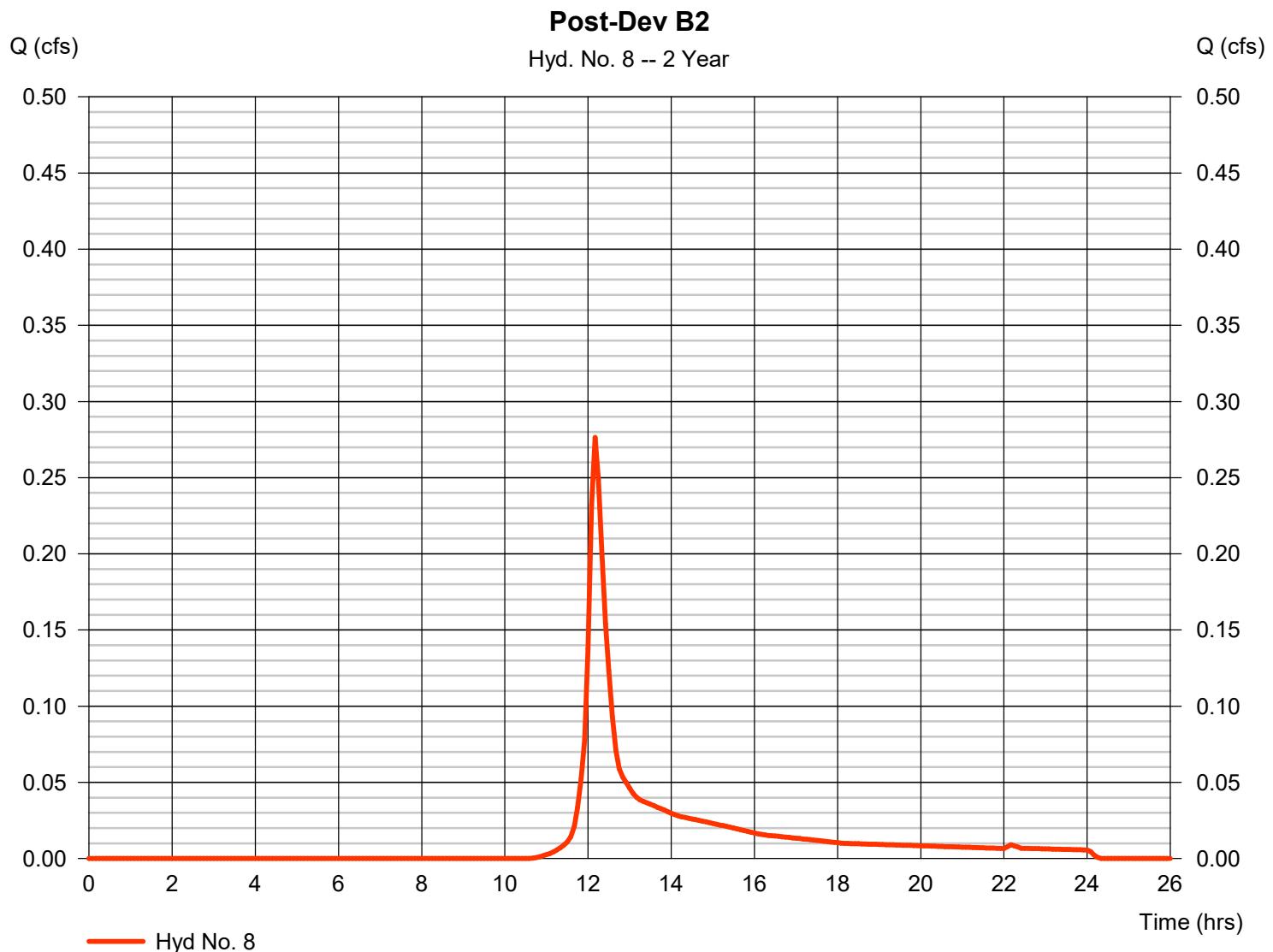
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.276 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 1,151 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

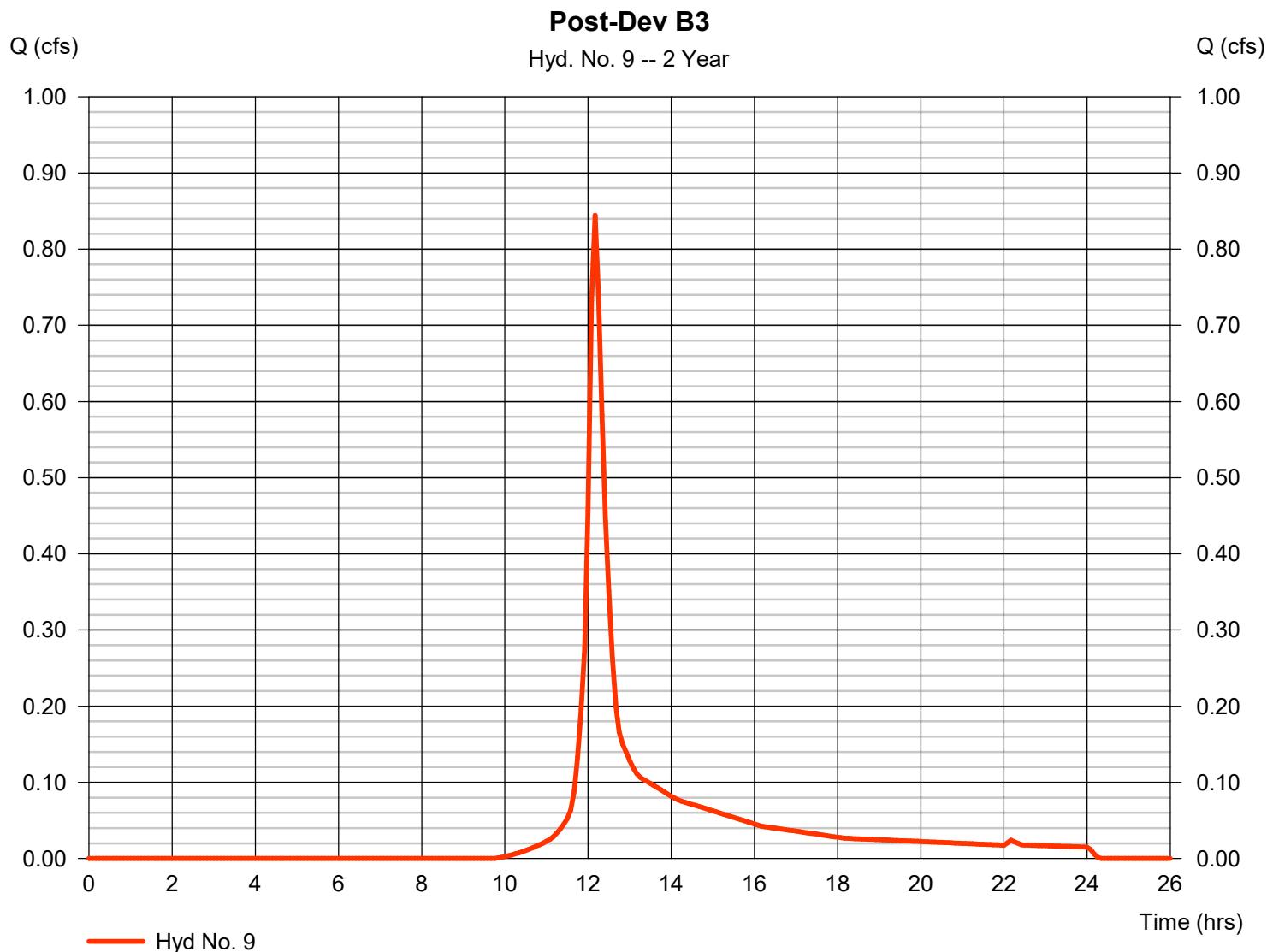
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.845 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 3,404 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Hyd. No. 9

Post-Dev B3

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>	
Sheet Flow					
Manning's n-value	= 0.240	0.011	0.011		
Flow length (ft)	= 100.0	0.0	0.0		
Two-year 24-hr precip. (in)	= 3.21	0.00	0.00		
Land slope (%)	= 4.00	0.00	0.00		
Travel Time (min)	= 10.80	+ 0.00	+ 0.00	=	10.80
Shallow Concentrated Flow					
Flow length (ft)	= 69.00	113.00	0.00		
Watercourse slope (%)	= 32.00	2.00	0.00		
Surface description	= Unpaved	Unpaved	Paved		
Average velocity (ft/s)	= 9.13	2.28	0.00		
Travel Time (min)	= 0.13	+ 0.83	+ 0.00	=	0.95
Channel Flow					
X sectional flow area (sqft)	= 0.00	0.00	0.00		
Wetted perimeter (ft)	= 0.00	0.00	0.00		
Channel slope (%)	= 0.00	0.00	0.00		
Manning's n-value	= 0.015	0.015	0.015		
Velocity (ft/s)	= 0.00	0.00	0.00		
Flow length (ft)	({0}) 0.0	0.0	0.0		
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	=	0.00
Total Travel Time, Tc					11.70 min

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

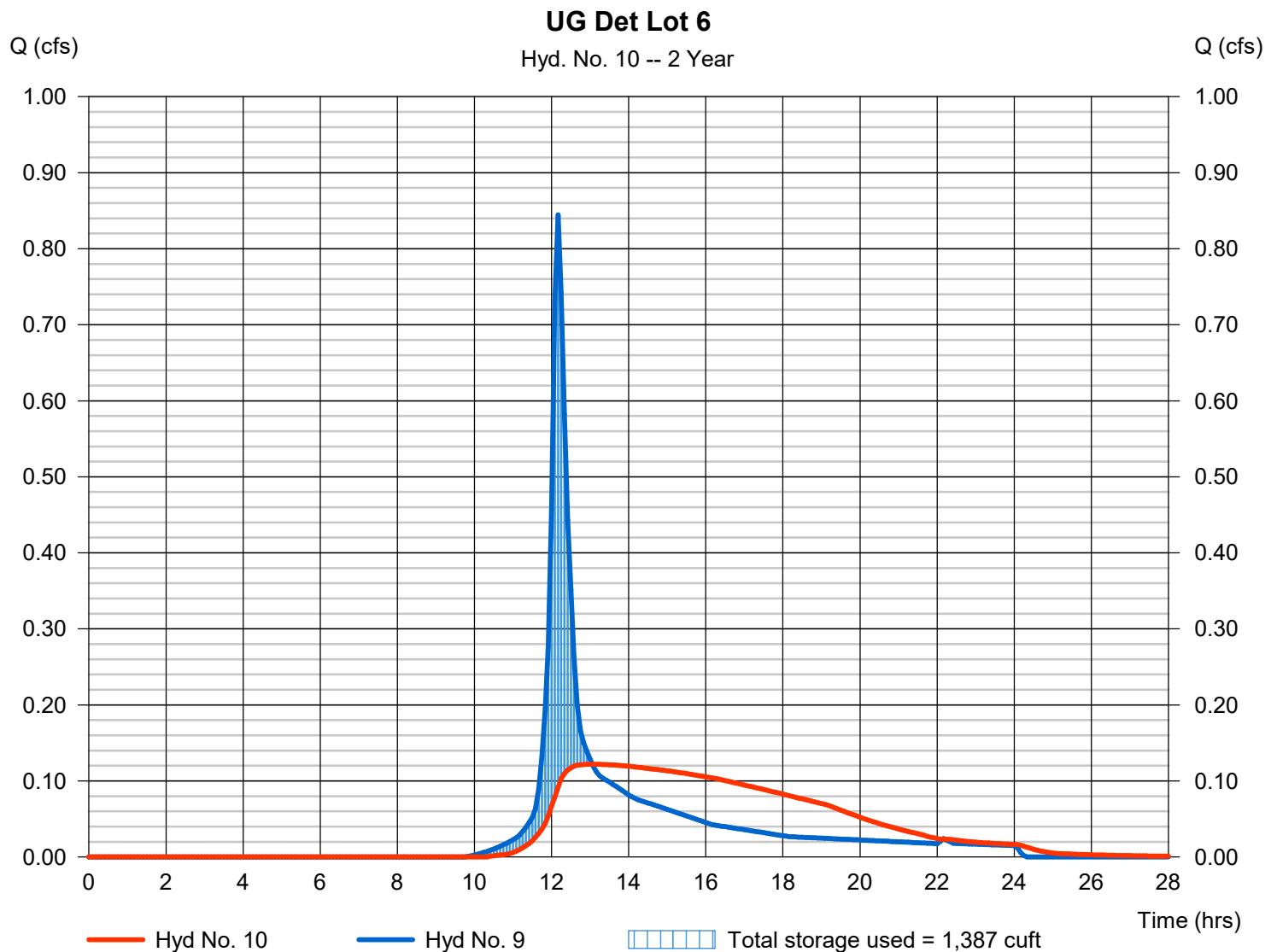
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 0.122 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.08 hrs
Time interval	= 5 min	Hyd. volume	= 3,397 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 305.27 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 1,387 cuft

Storage Indication method used.



Pond Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Pond No. 2 - UG Det Lot6

Pond Data

UG Chambers -Invert elev. = 304.50 ft, Rise x Span = 3.75 x 6.40 ft, Barrel Len = 173.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 303.75 ft, Width = 8.40 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	303.75	n/a	0	0
0.55	304.30	n/a	320	320
1.10	304.85	n/a	552	872
1.65	305.40	n/a	680	1,552
2.20	305.95	n/a	666	2,218
2.75	306.50	n/a	644	2,862
3.30	307.05	n/a	610	3,471
3.85	307.60	n/a	559	4,030
4.40	308.15	n/a	475	4,505
4.95	308.70	n/a	330	4,835
5.50	309.25	n/a	320	5,155

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	2.00	4.00	0.00	Crest Len (ft)	= 3.50	0.00	0.00	0.00
Span (in)	= 12.00	2.00	4.00	0.00	Crest El. (ft)	= 308.75	0.00	0.00	0.00
No. Barrels	= 1	1	1	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 303.75	303.75	305.75	0.00	Weir Type	= Rect	---	---	---
Length (ft)	= 8.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 1.00	0.00	0.00	n/a					
N-Value	= .013	.013	.013	n/a					
Orifice Coeff.	= 0.60	0.60	0.60	0.60	Exfil.(in/hr)		= 0.000 (by Contour)		
Multi-Stage	= n/a	Yes	Yes	No	TW Elev. (ft)		= 0.00		

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	303.75	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.55	320	304.30	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.068
1.10	872	304.85	0.11 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.102
1.65	1,552	305.40	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.128
2.20	2,218	305.95	0.24 oc	0.15 ic	0.08 ic	---	0.00	---	---	---	---	---	0.231
2.75	2,862	306.50	0.49 oc	0.16 ic	0.32 ic	---	0.00	---	---	---	---	---	0.482
3.30	3,471	307.05	0.63 oc	0.18 ic	0.45 ic	---	0.00	---	---	---	---	---	0.624
3.85	4,030	307.60	0.74 oc	0.19 ic	0.55 ic	---	0.00	---	---	---	---	---	0.736
4.40	4,505	308.15	0.84 oc	0.21 ic	0.63 ic	---	0.00	---	---	---	---	---	0.833
4.95	4,835	308.70	0.92 oc	0.22 ic	0.70 ic	---	0.00	---	---	---	---	---	0.919
5.50	5,155	309.25	5.06 ic	0.19 ic	0.75 ic	---	4.12	---	---	---	---	---	5.061

Hydrograph Report

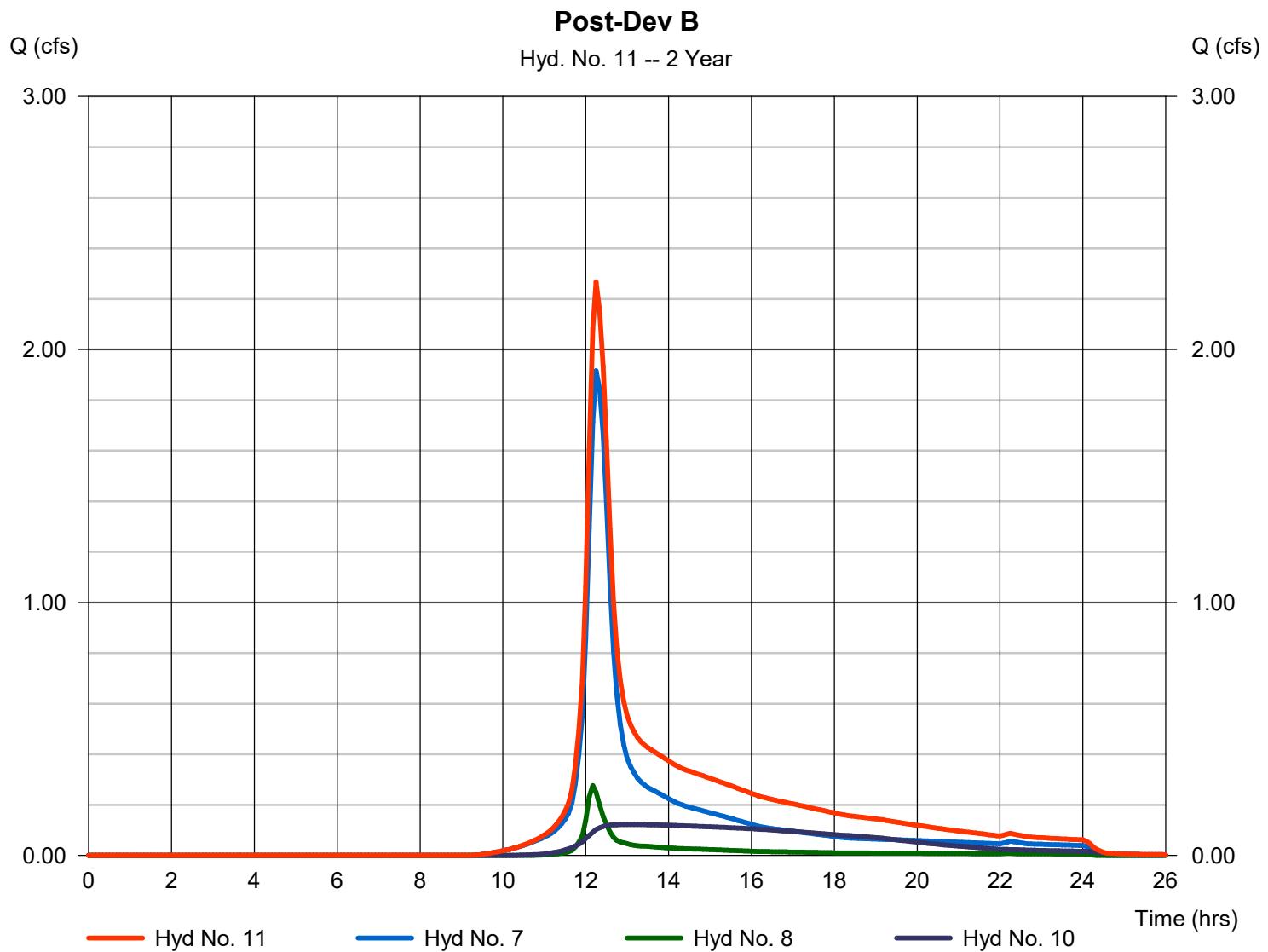
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 11

Post-Dev B

Hydrograph type	= Combine	Peak discharge	= 2.268 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 13,843 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 2.082 ac

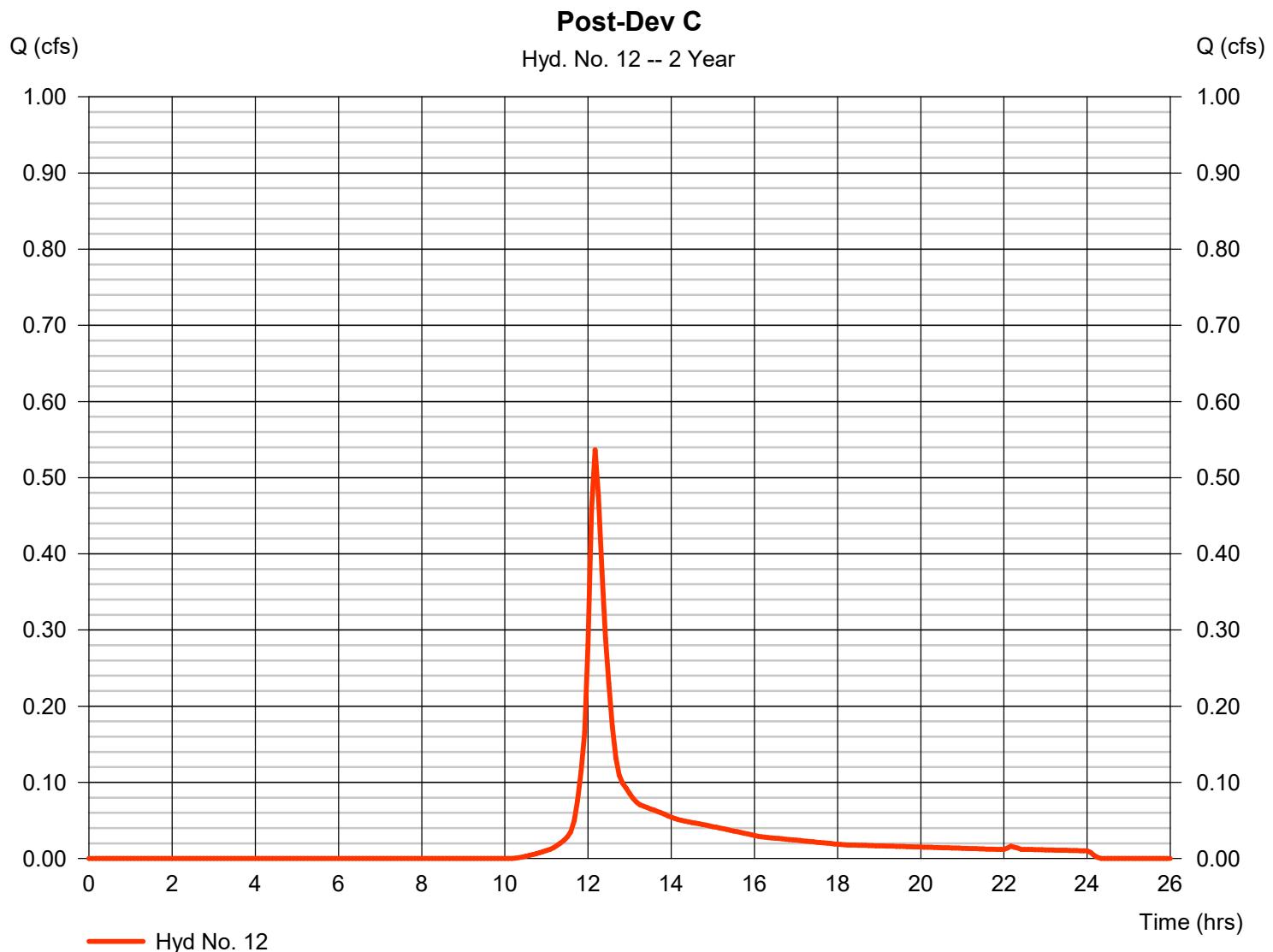


Hydrograph Report

Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.537 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 2,190 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.21 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

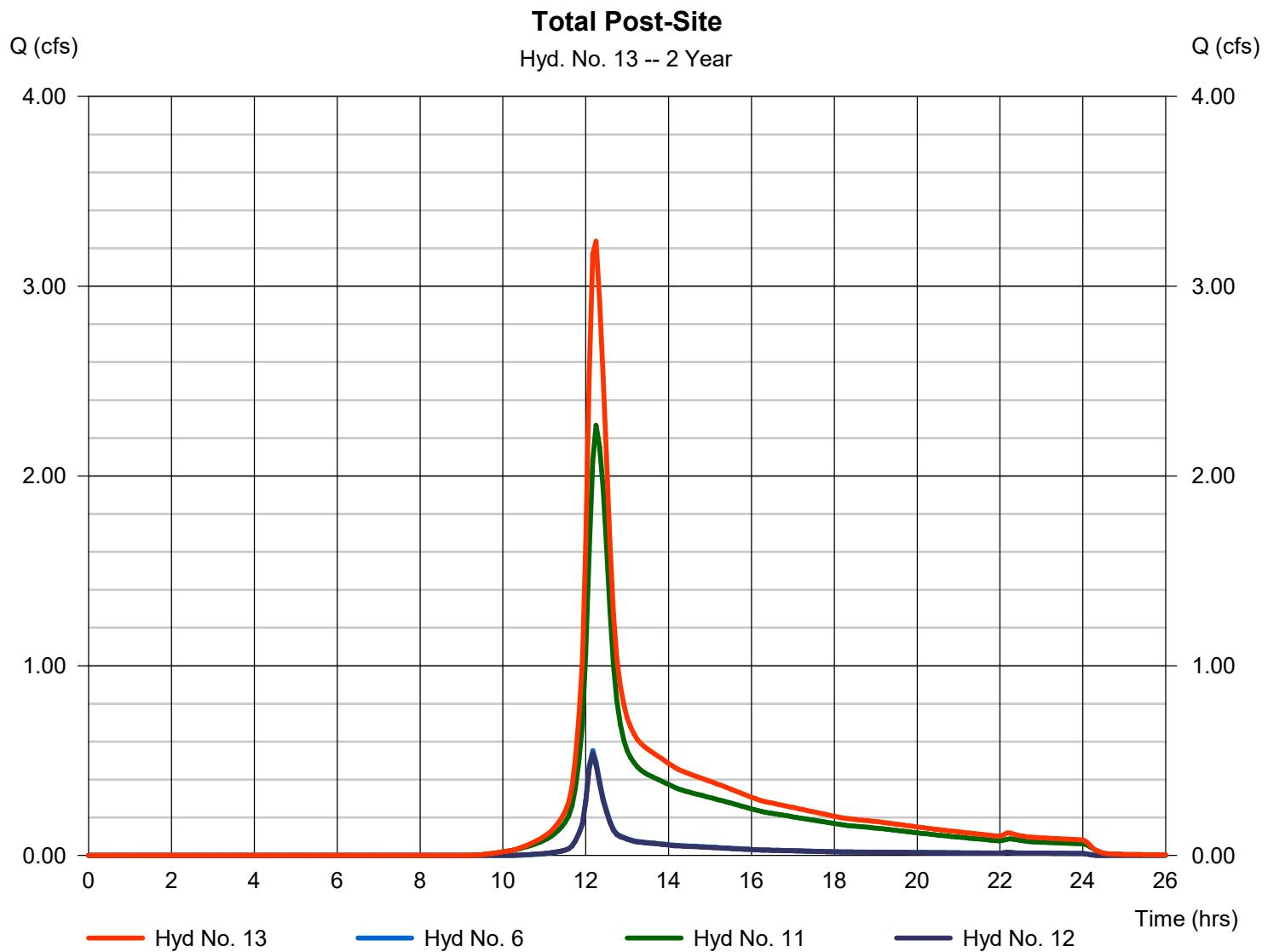
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 3.237 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 18,297 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac

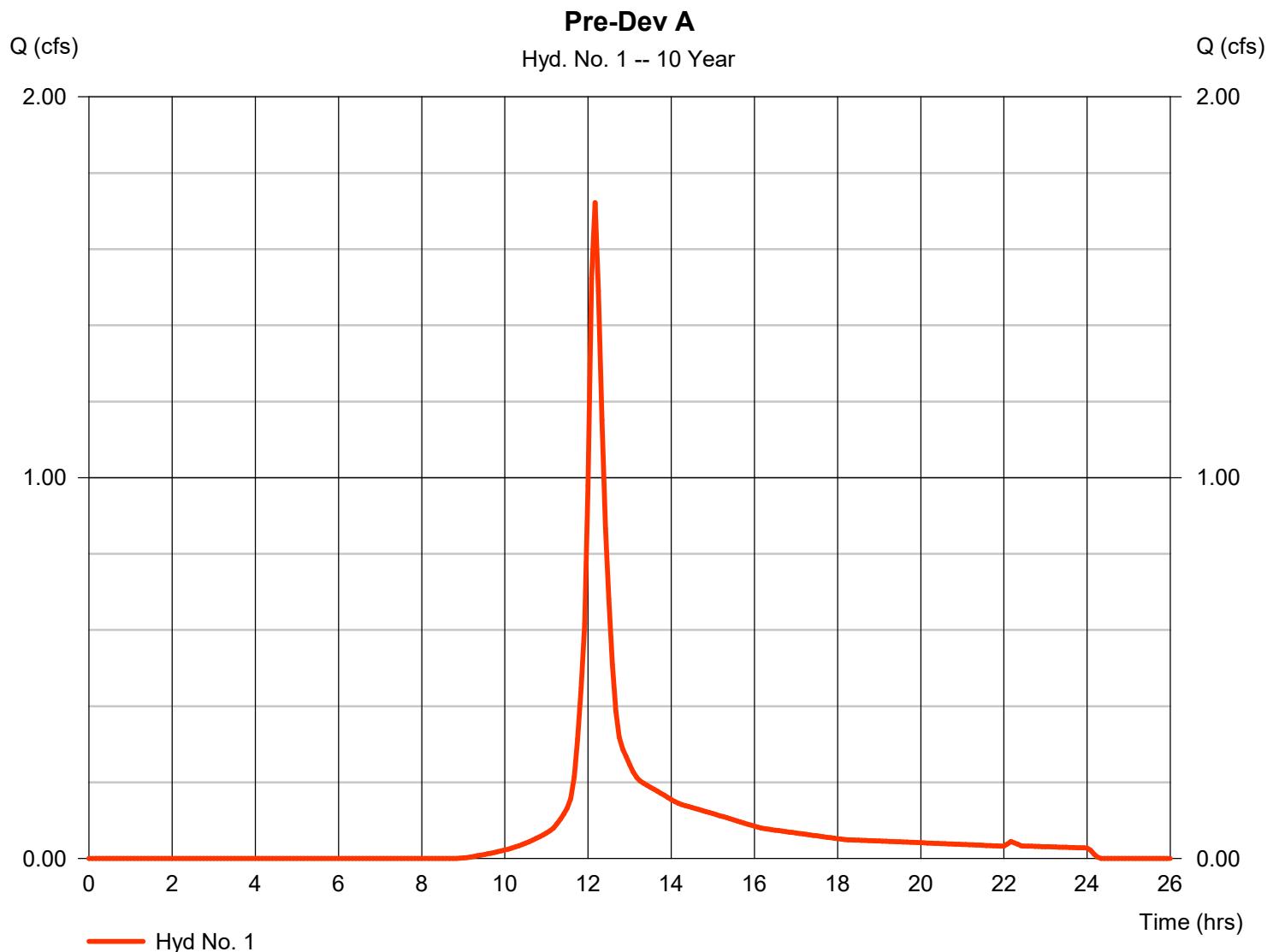


Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.722 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 6,855 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

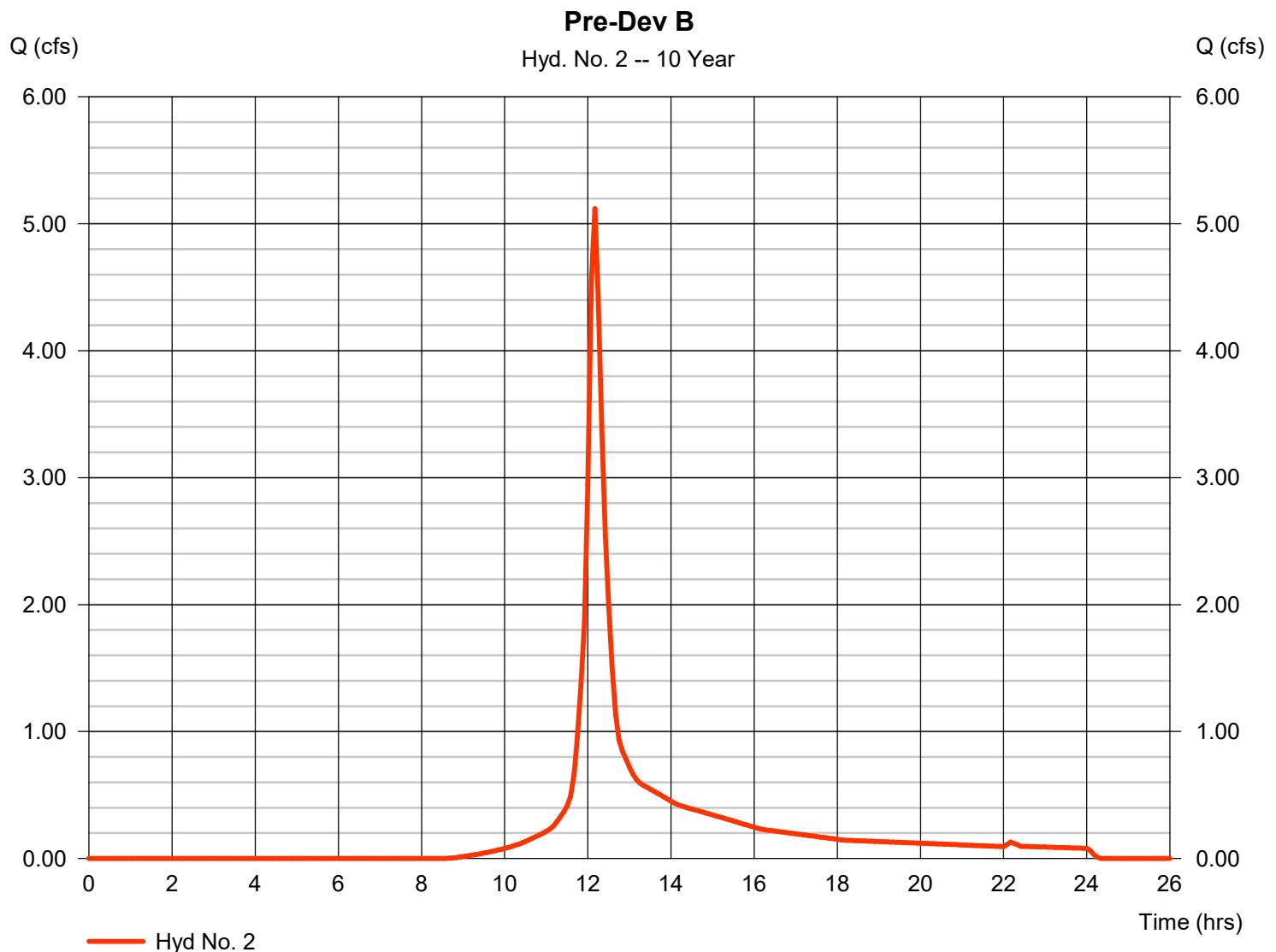


Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 5.119 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 20,345 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

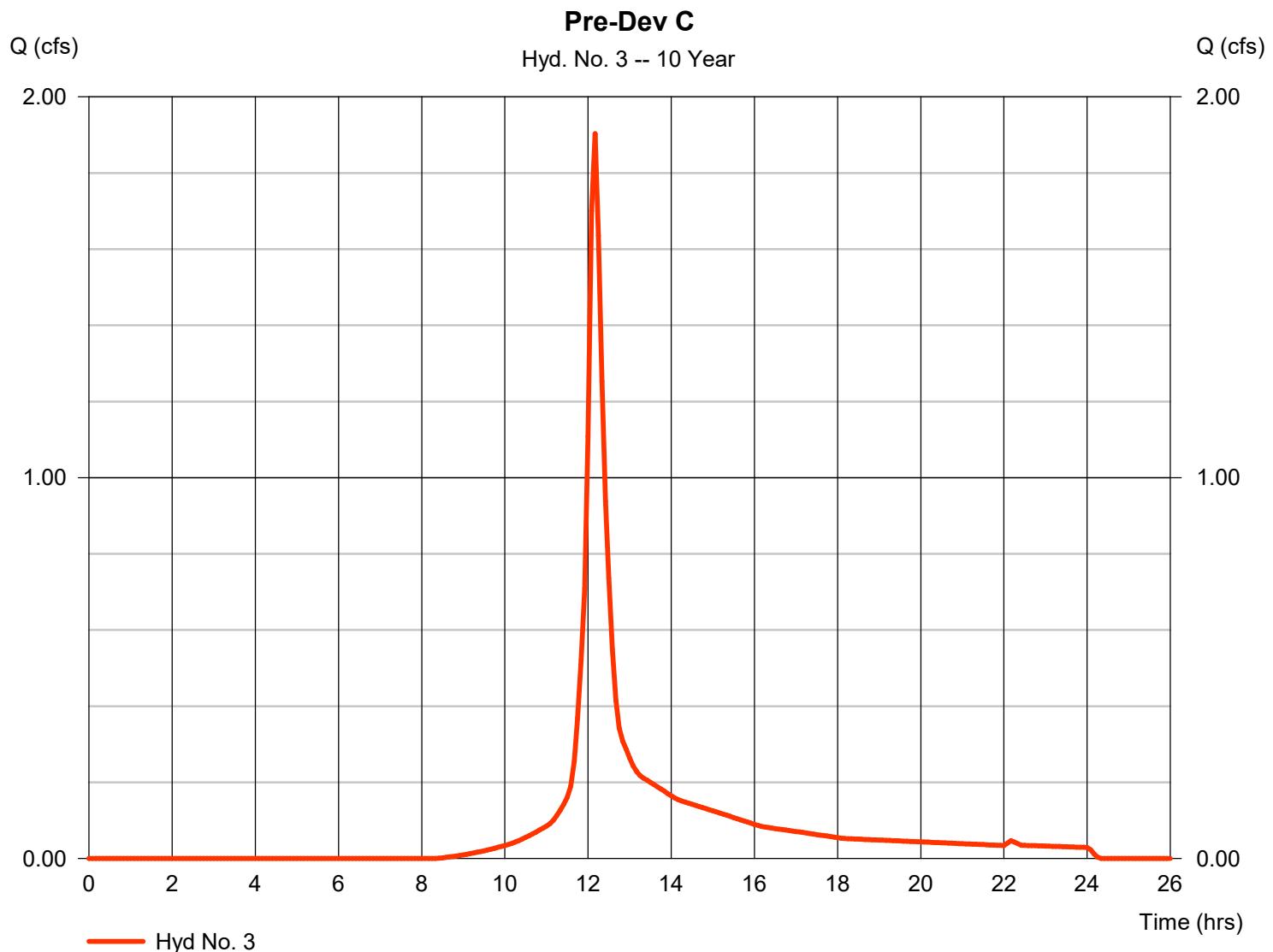


Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.904 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 7,561 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

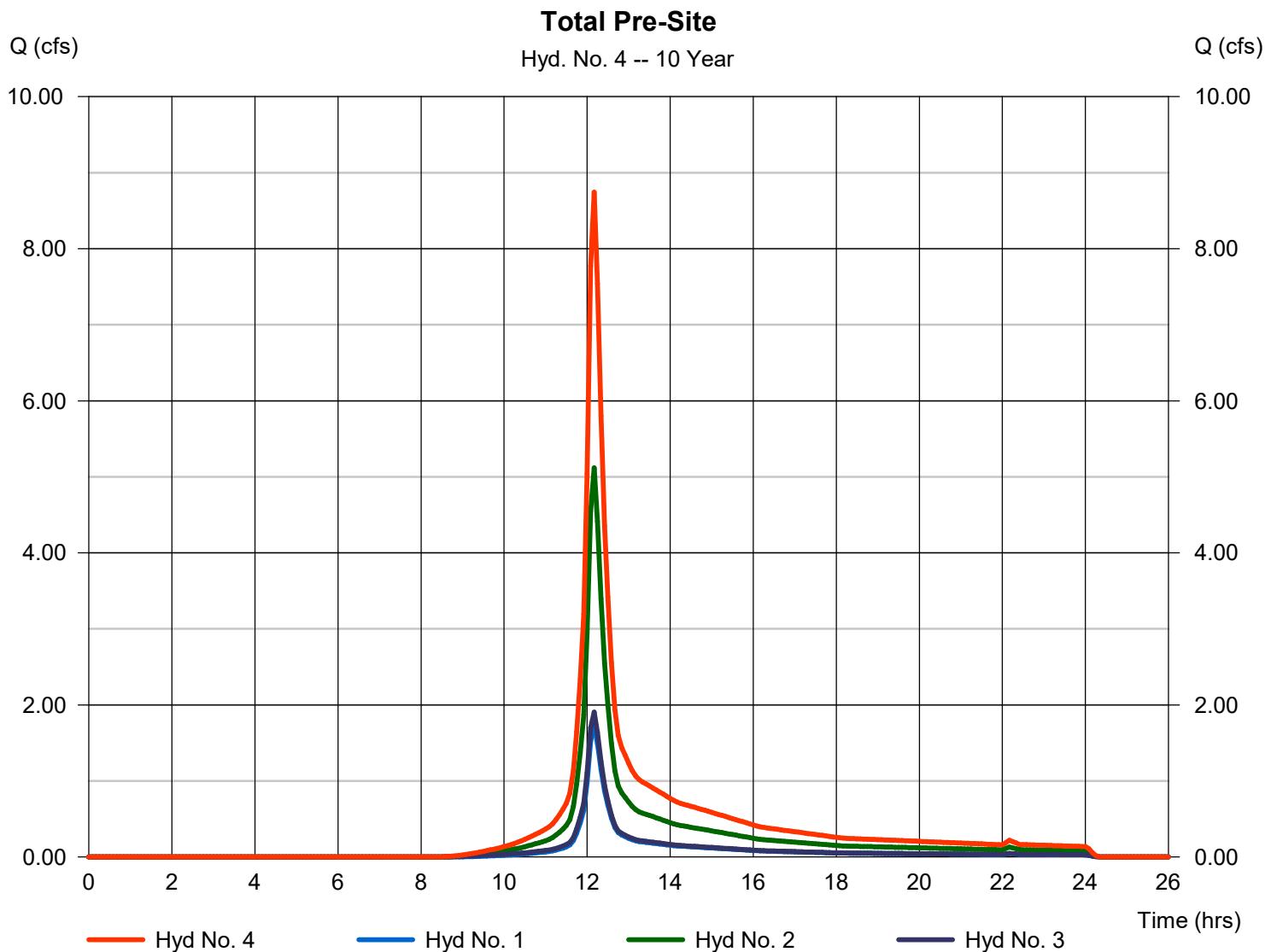
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Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 8.744 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 34,761 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac



Hydrograph Report

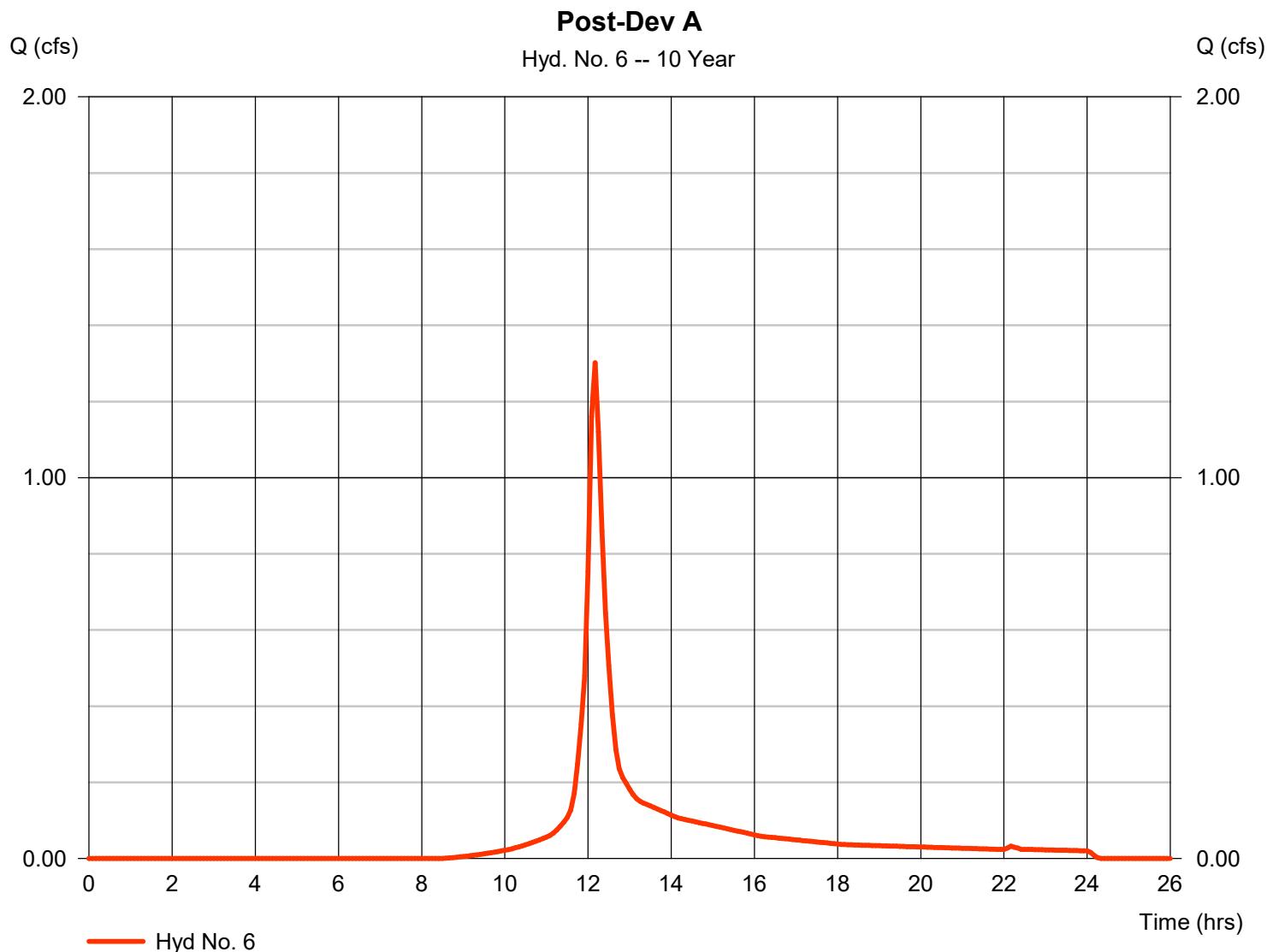
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.302 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 5,172 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

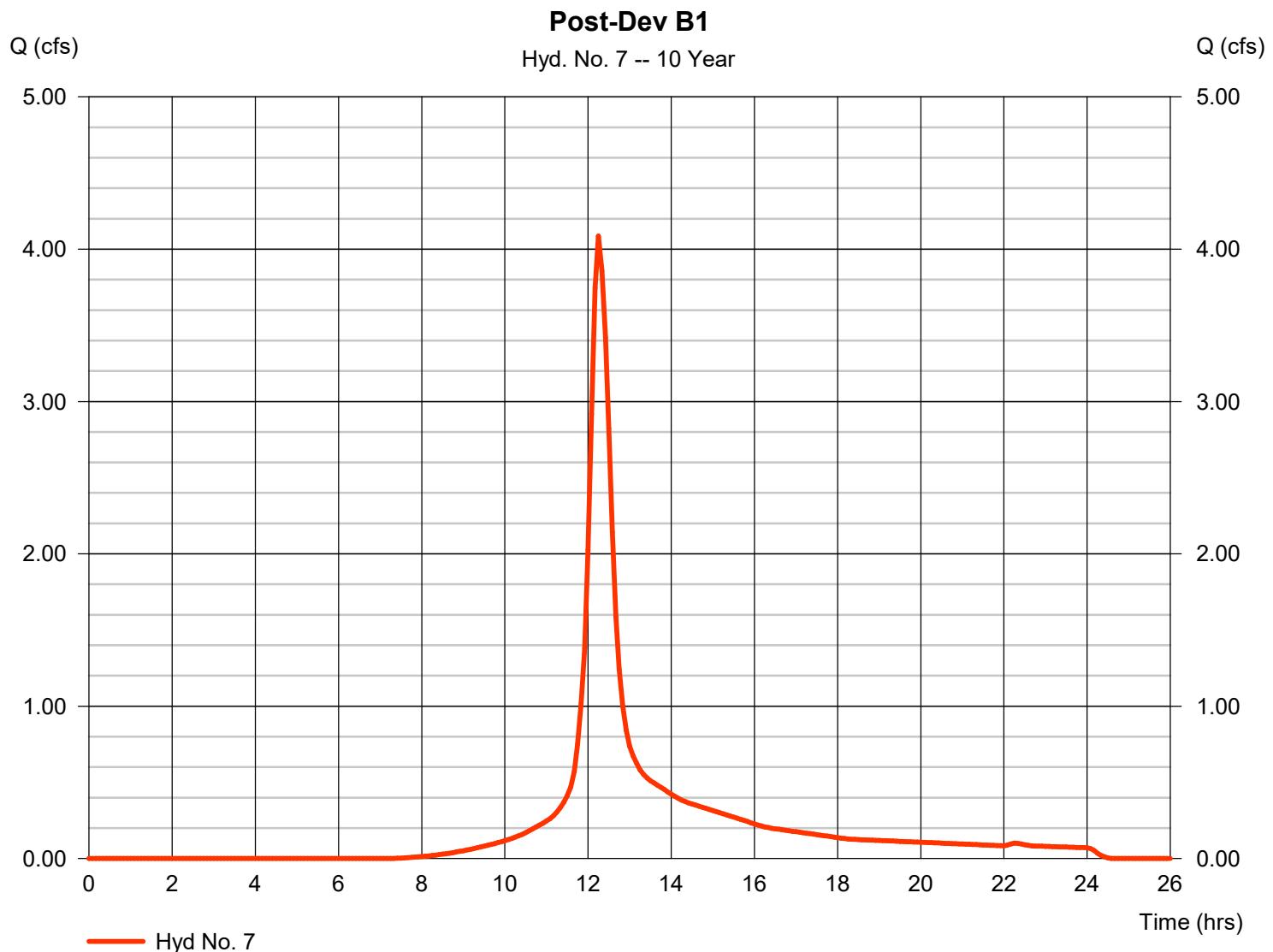


Hydrograph Report

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.086 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 19,605 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

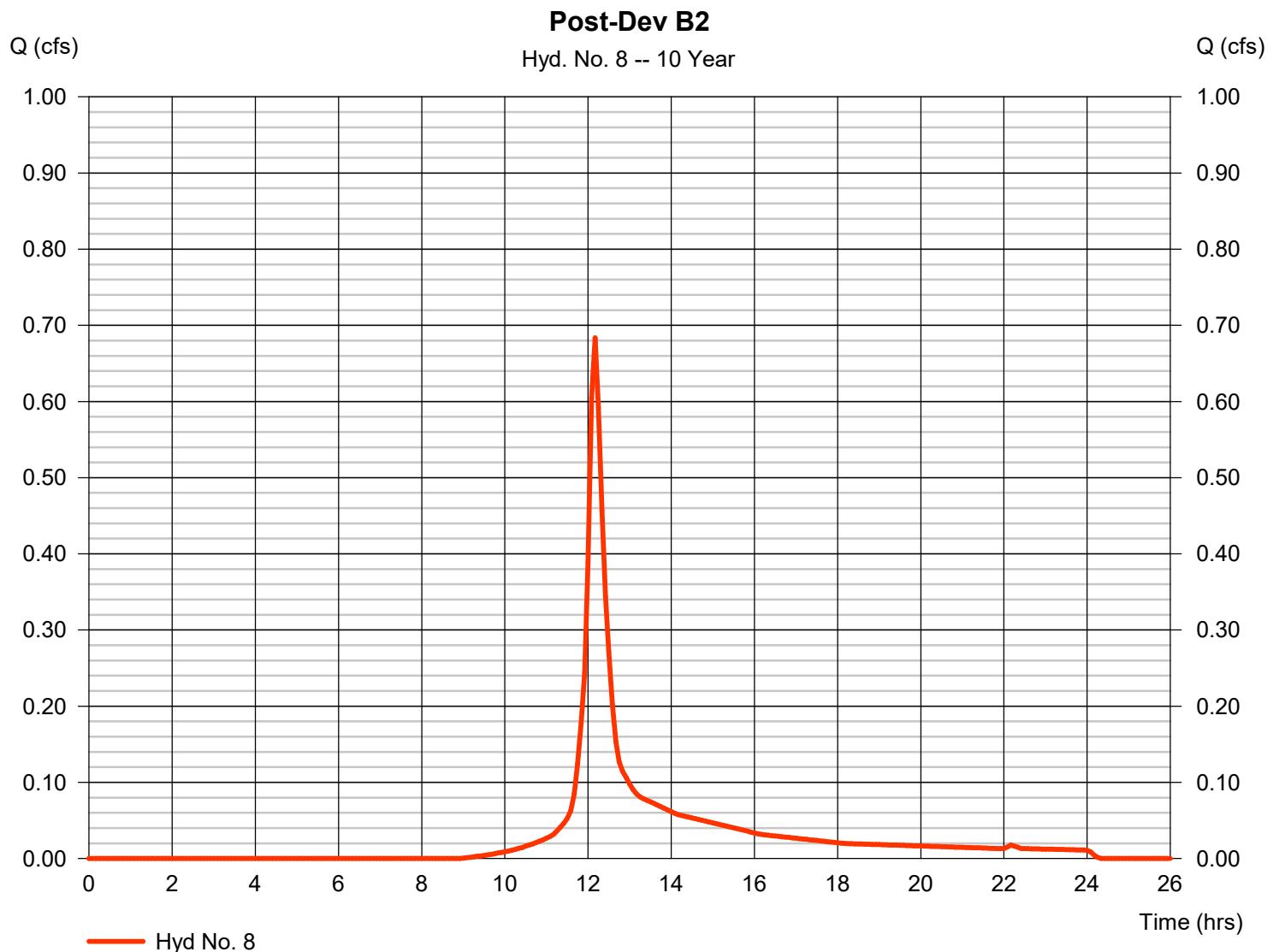


Hydrograph Report

Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.684 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 2,722 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

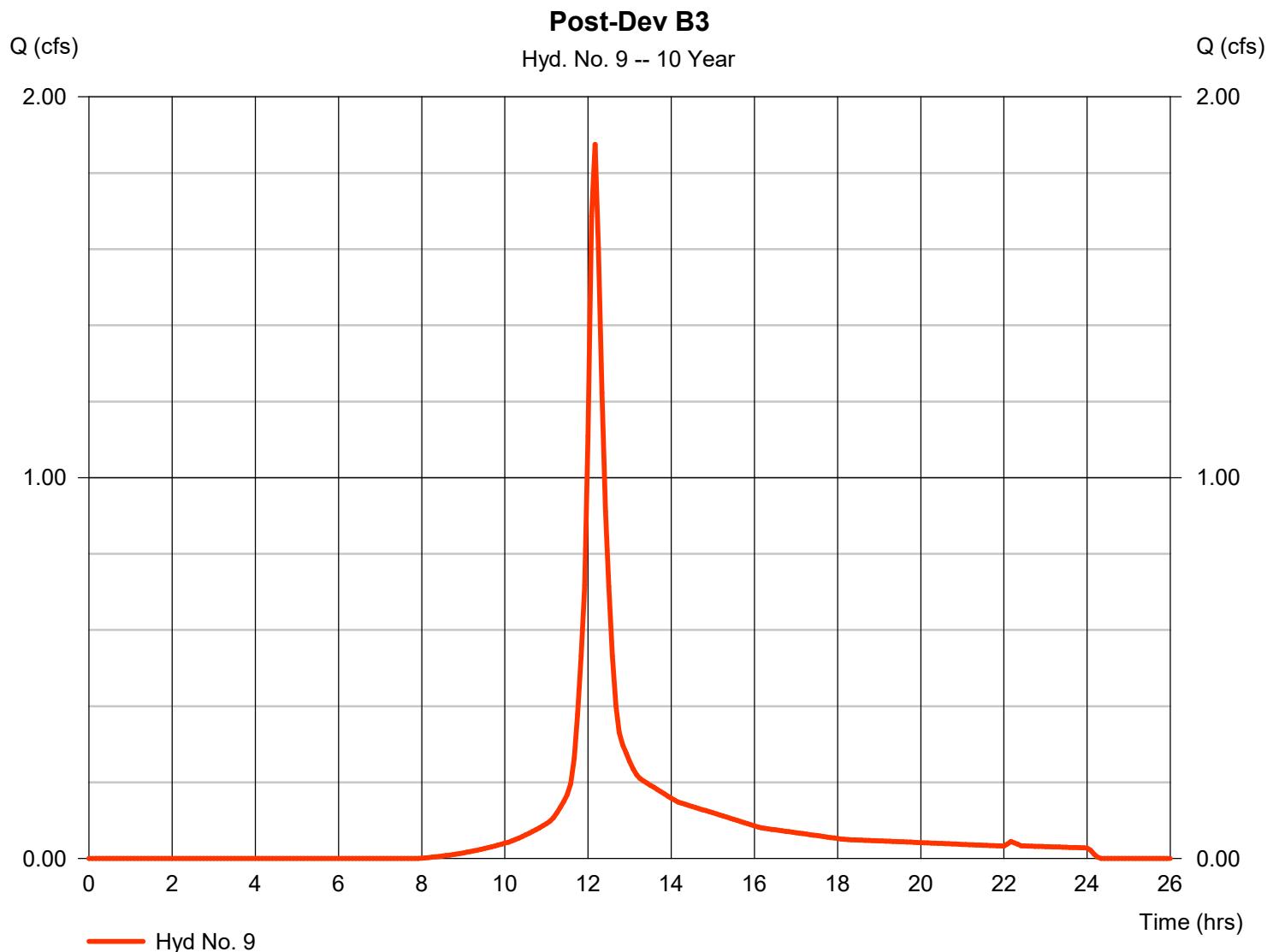
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Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.876 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 7,452 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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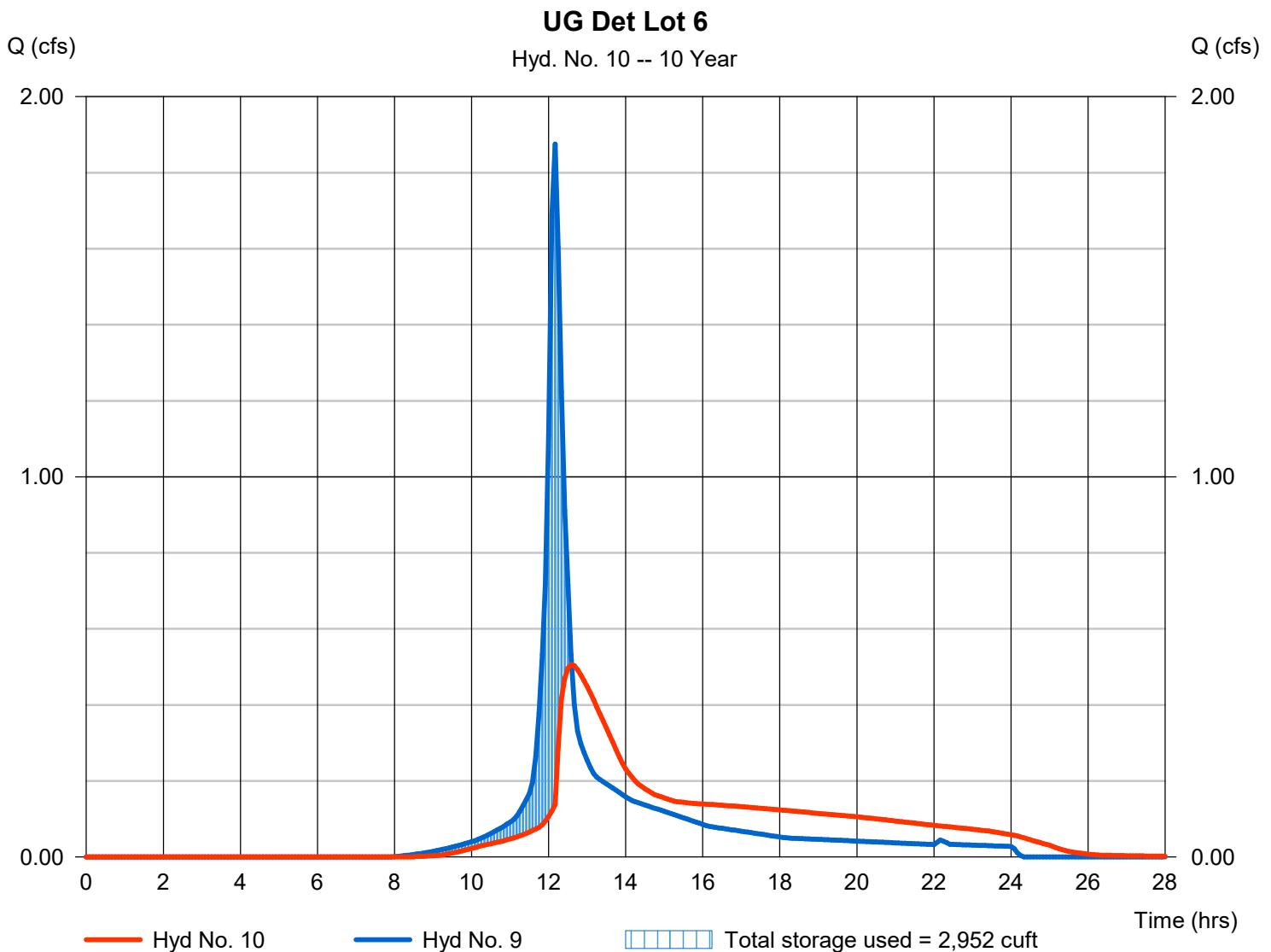
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 0.506 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.58 hrs
Time interval	= 5 min	Hyd. volume	= 7,445 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 306.58 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 2,952 cuft

Storage Indication method used.



Hydrograph Report

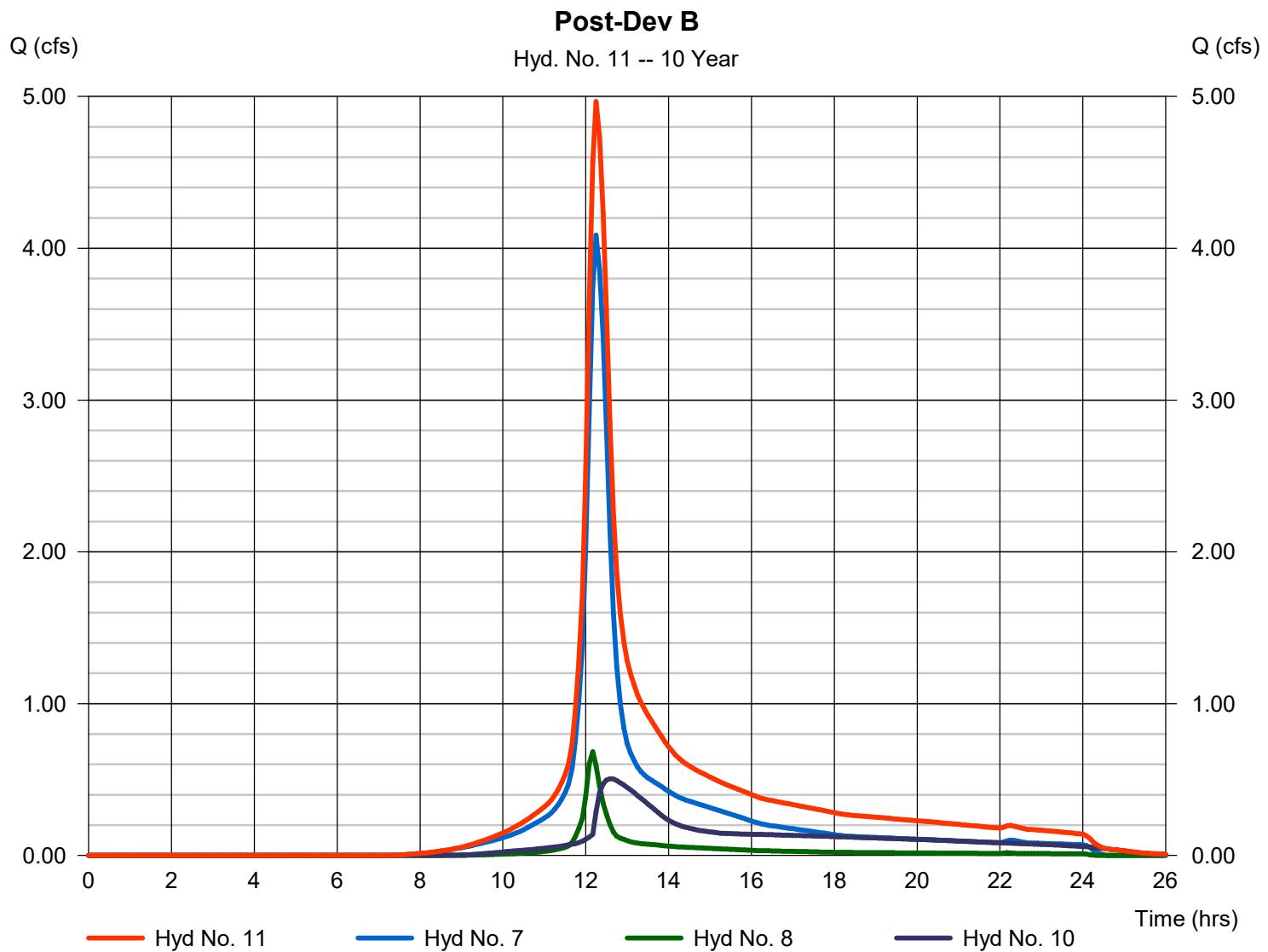
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Monday, 07 / 1 / 2019

Hyd. No. 11

Post-Dev B

Hydrograph type	= Combine	Peak discharge	= 4.967 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 29,772 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 2.082 ac

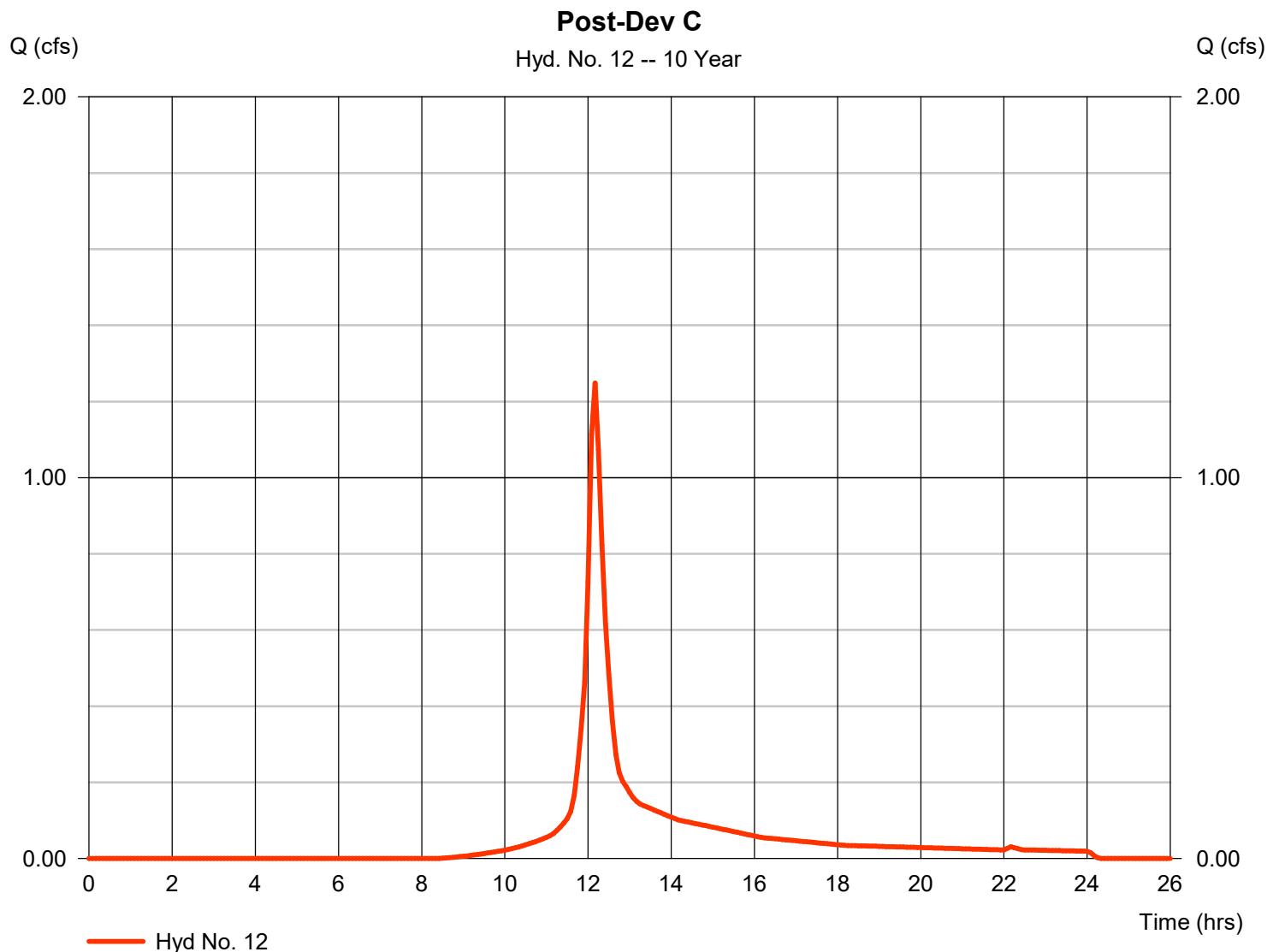


Hydrograph Report

Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.248 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 4,959 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.13 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

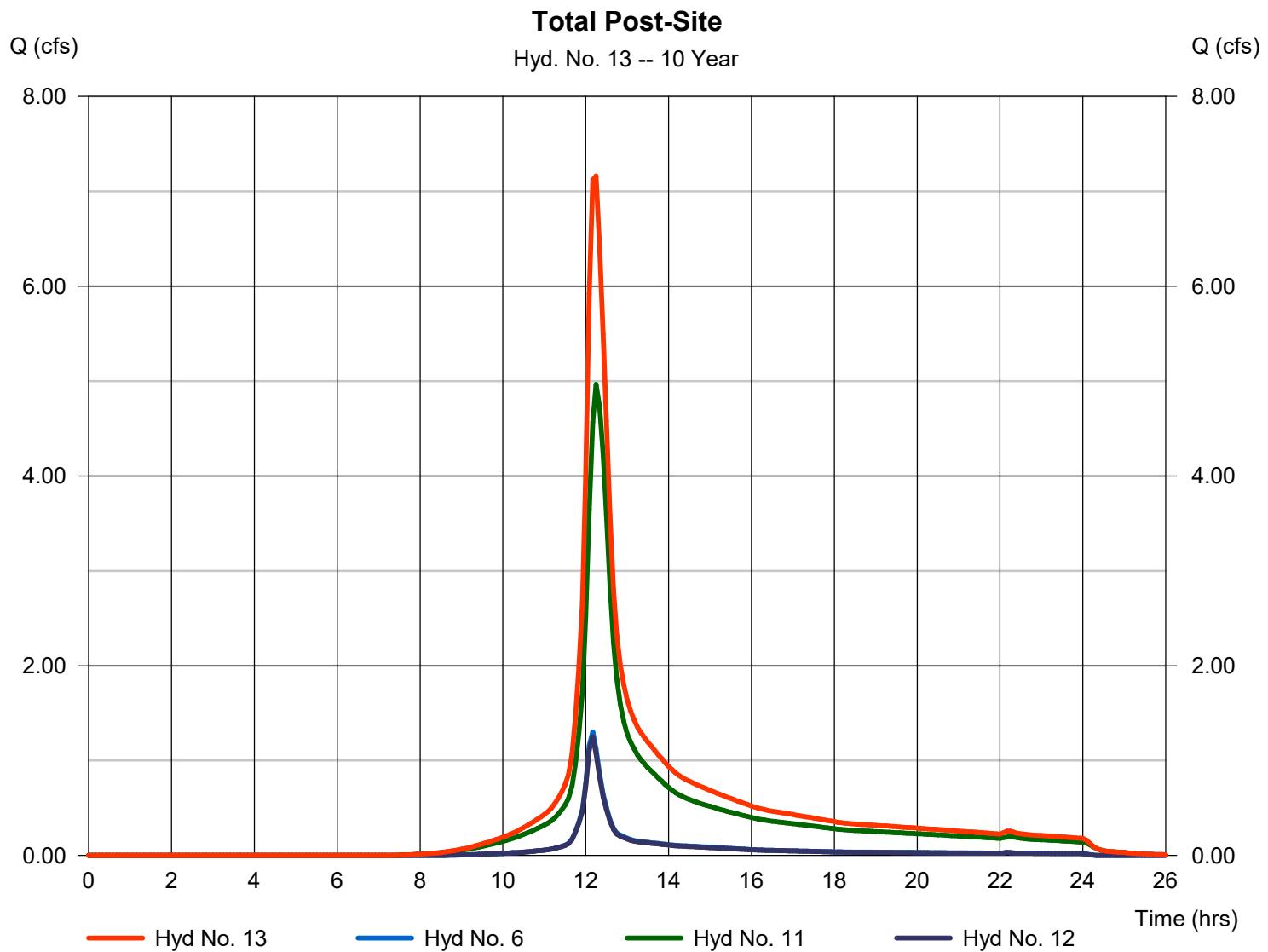
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Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 7.161 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 39,904 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac

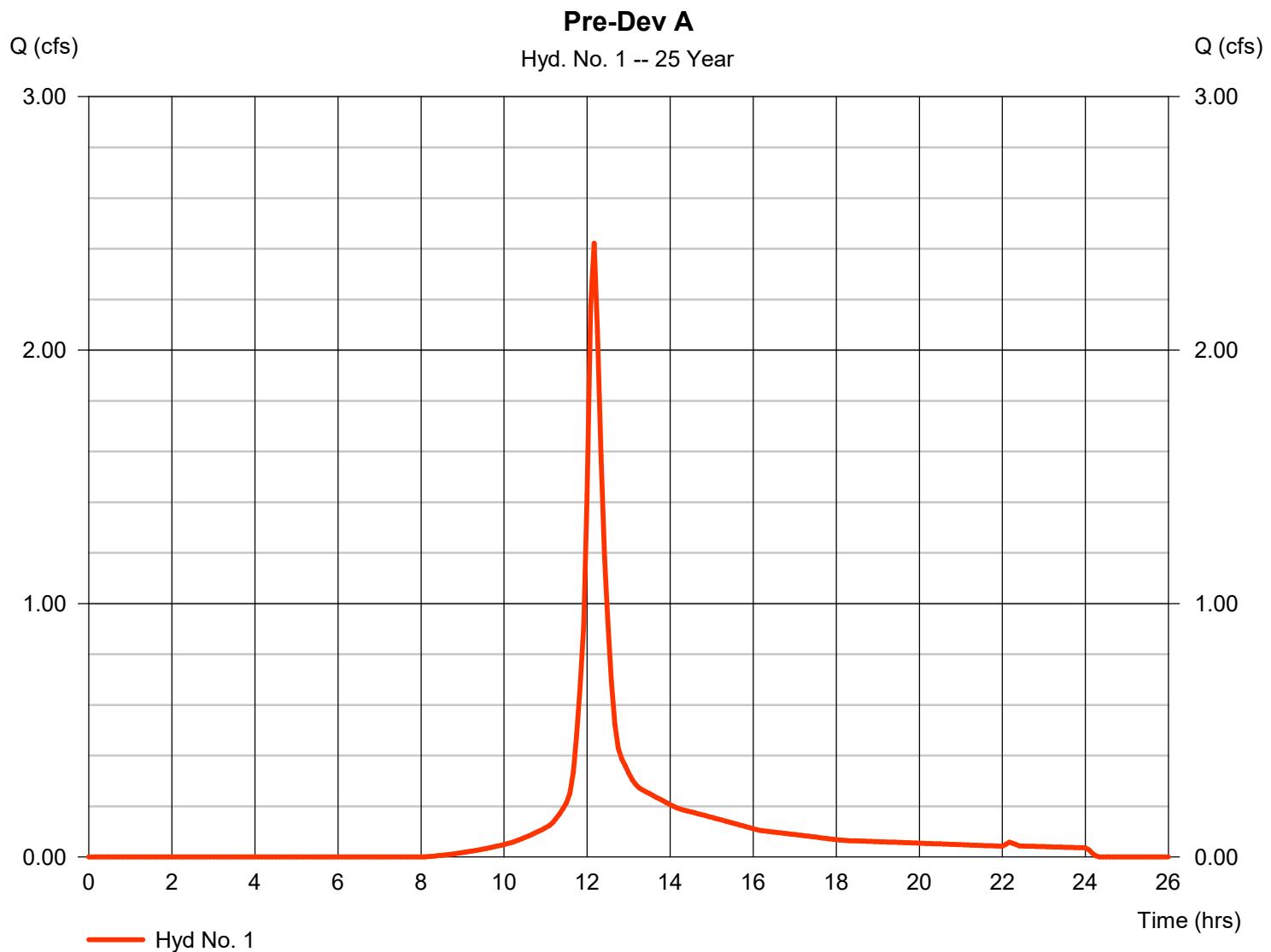


Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.422 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 9,620 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

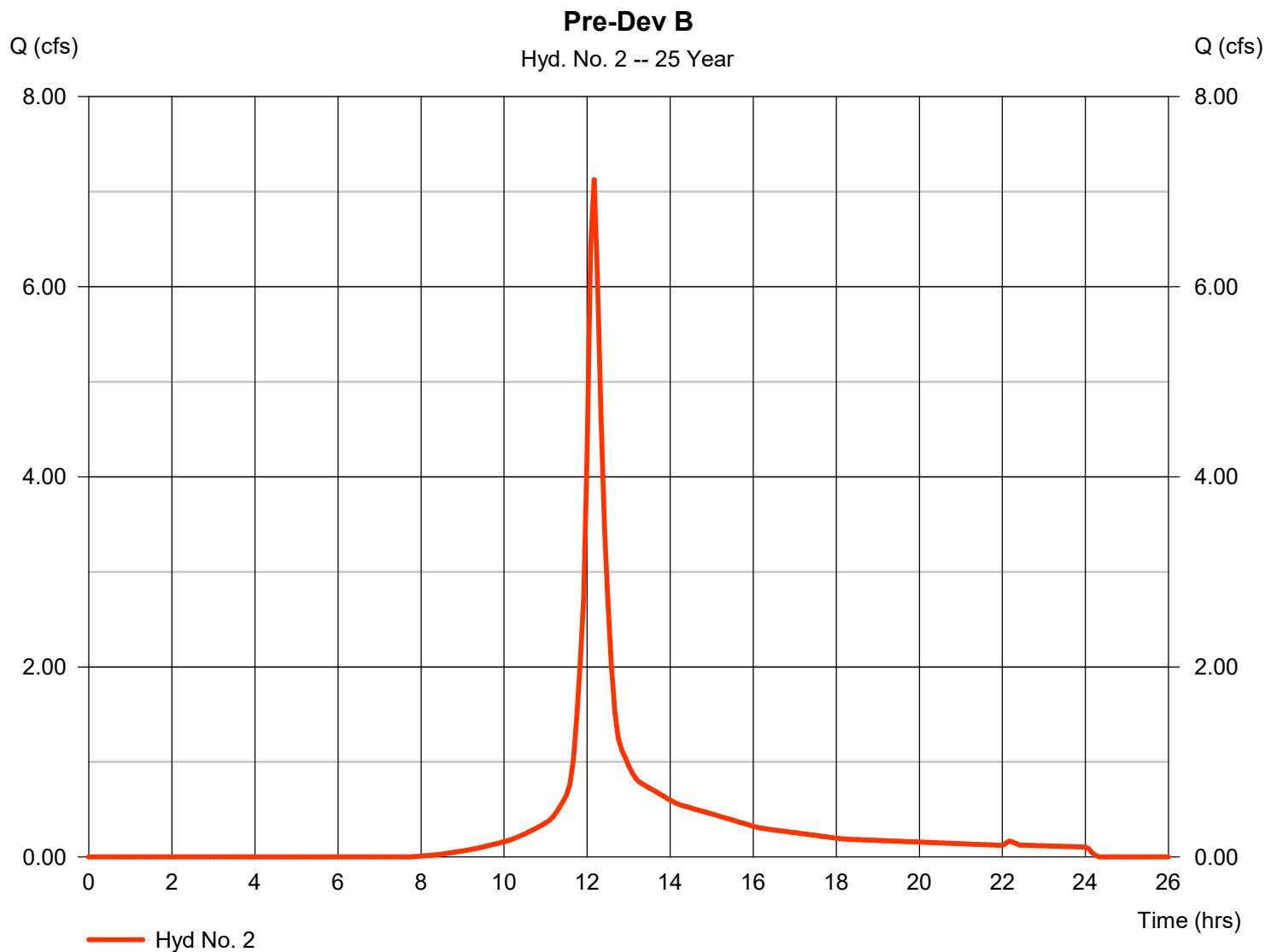


Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 7.129 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 28,338 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

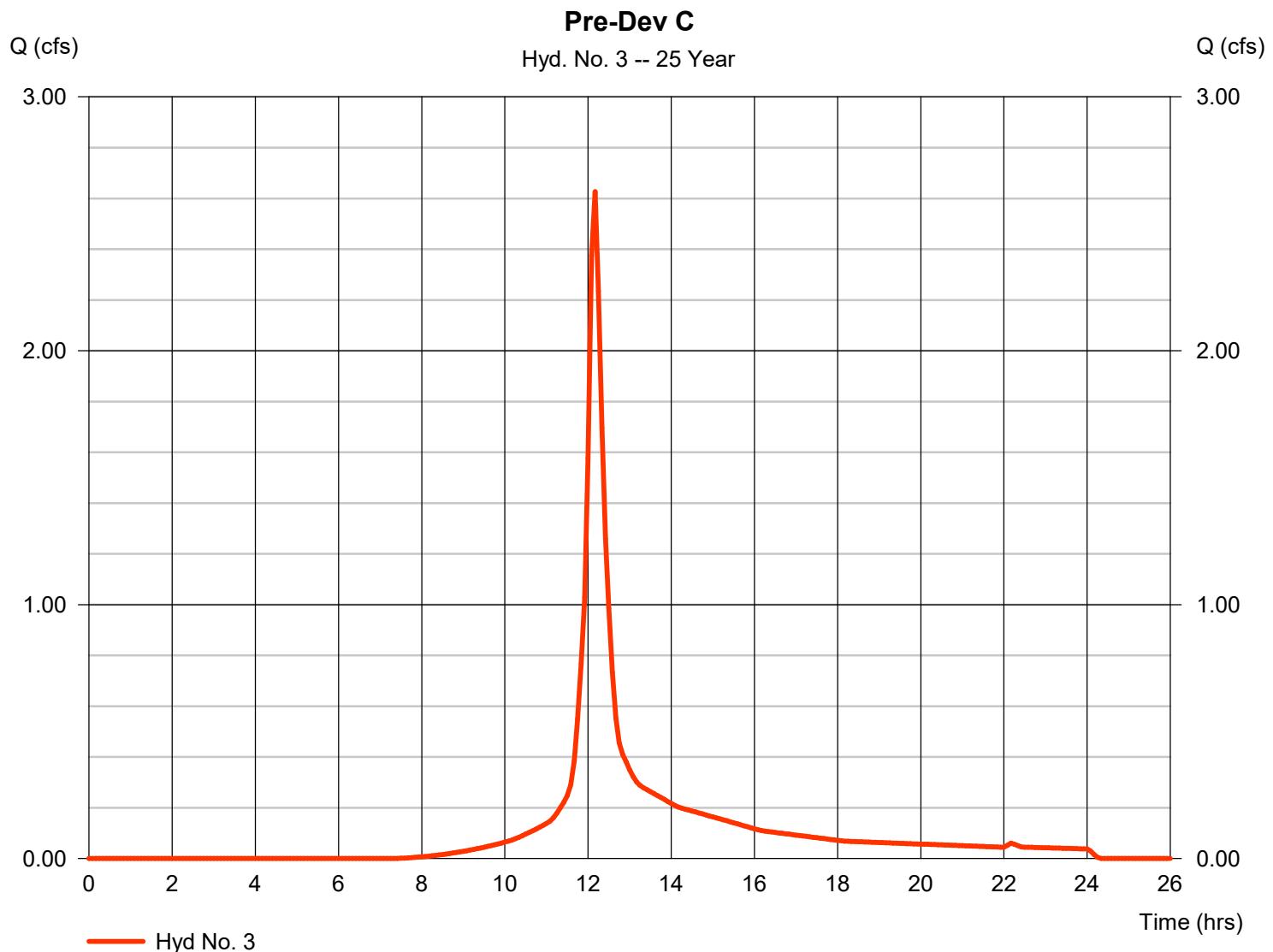


Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.626 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 10,453 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

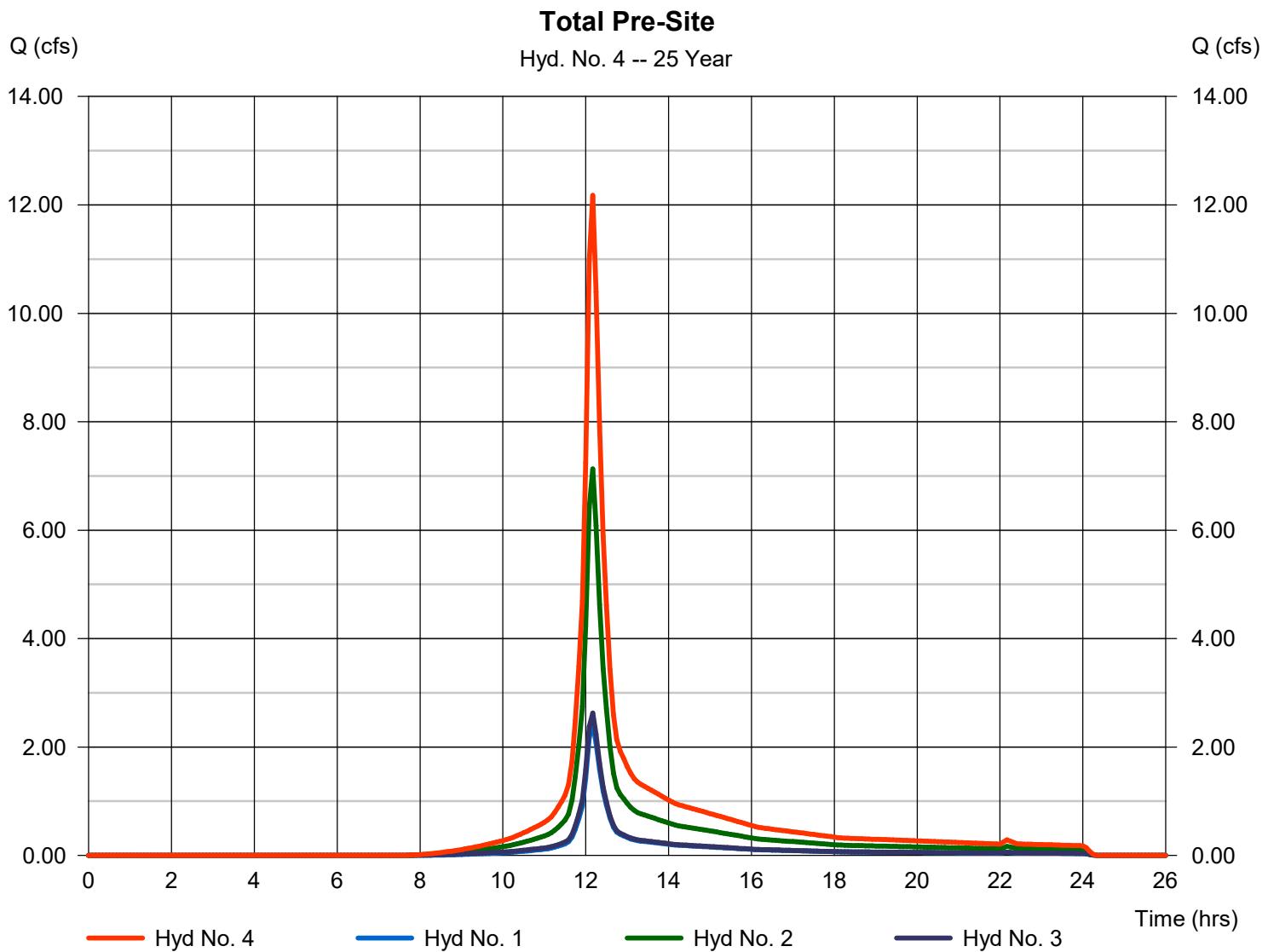
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Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 12.18 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 48,411 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac

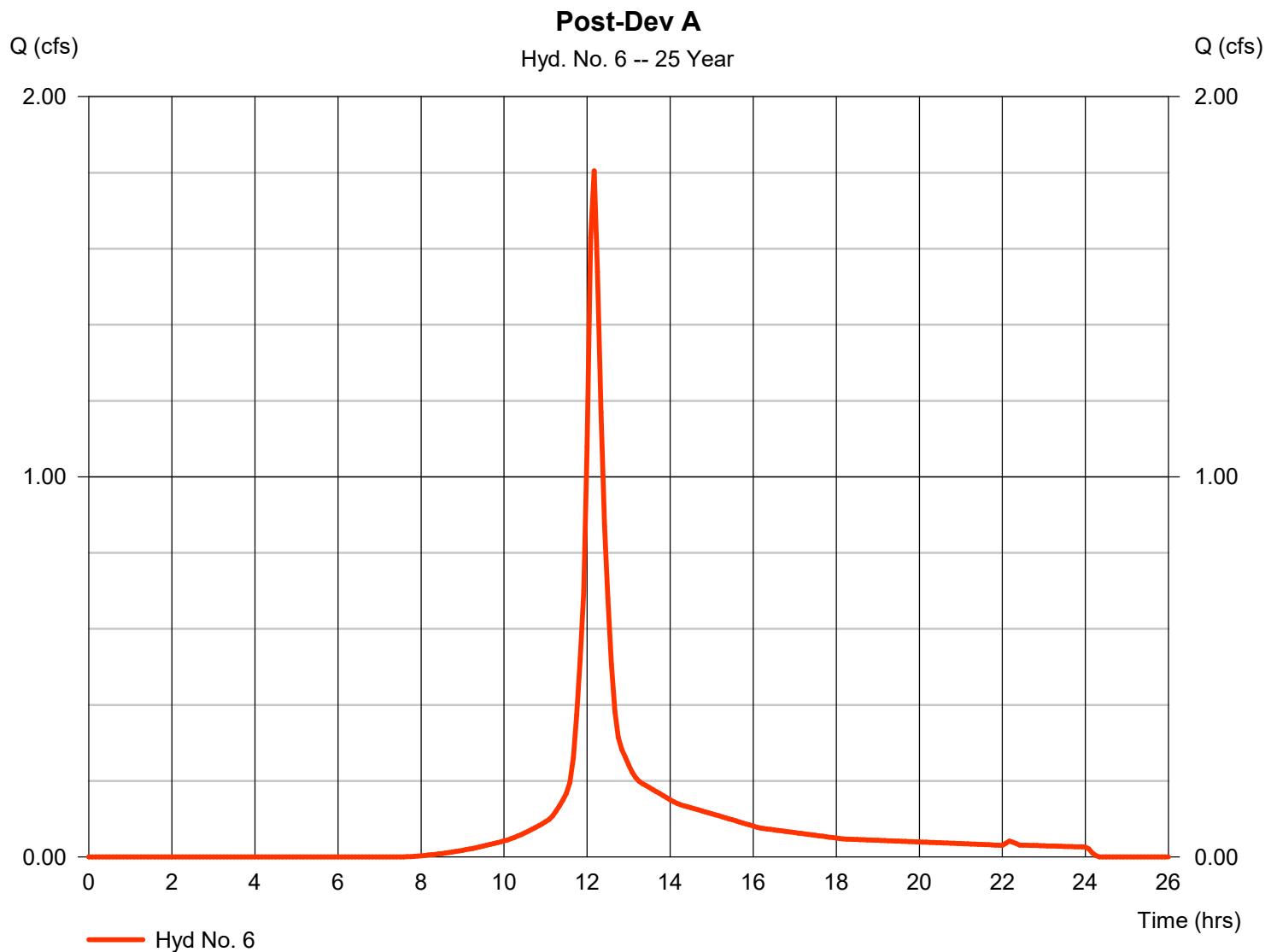


Hydrograph Report

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.805 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 7,180 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

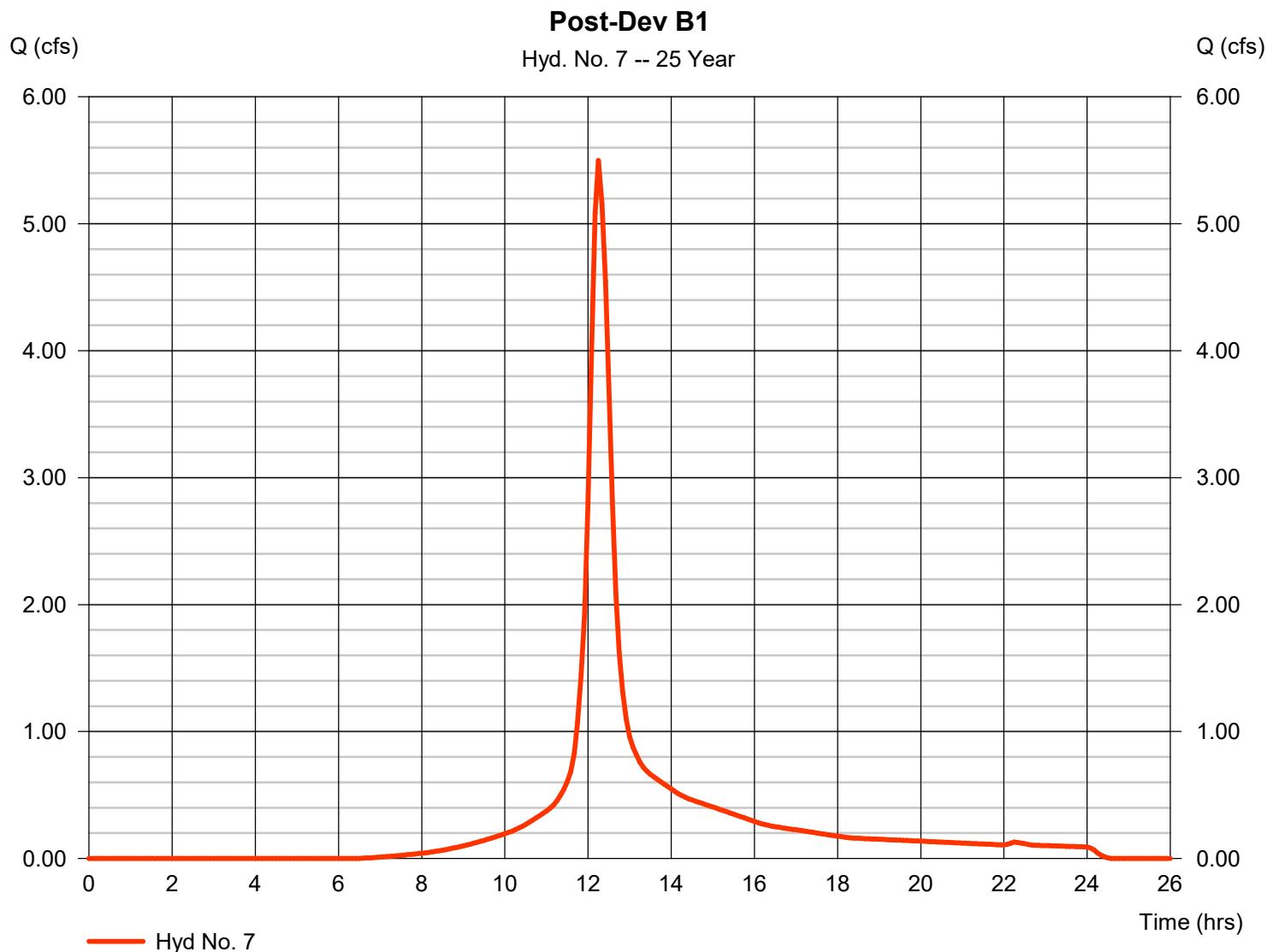


Hydrograph Report

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 5.498 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 26,509 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

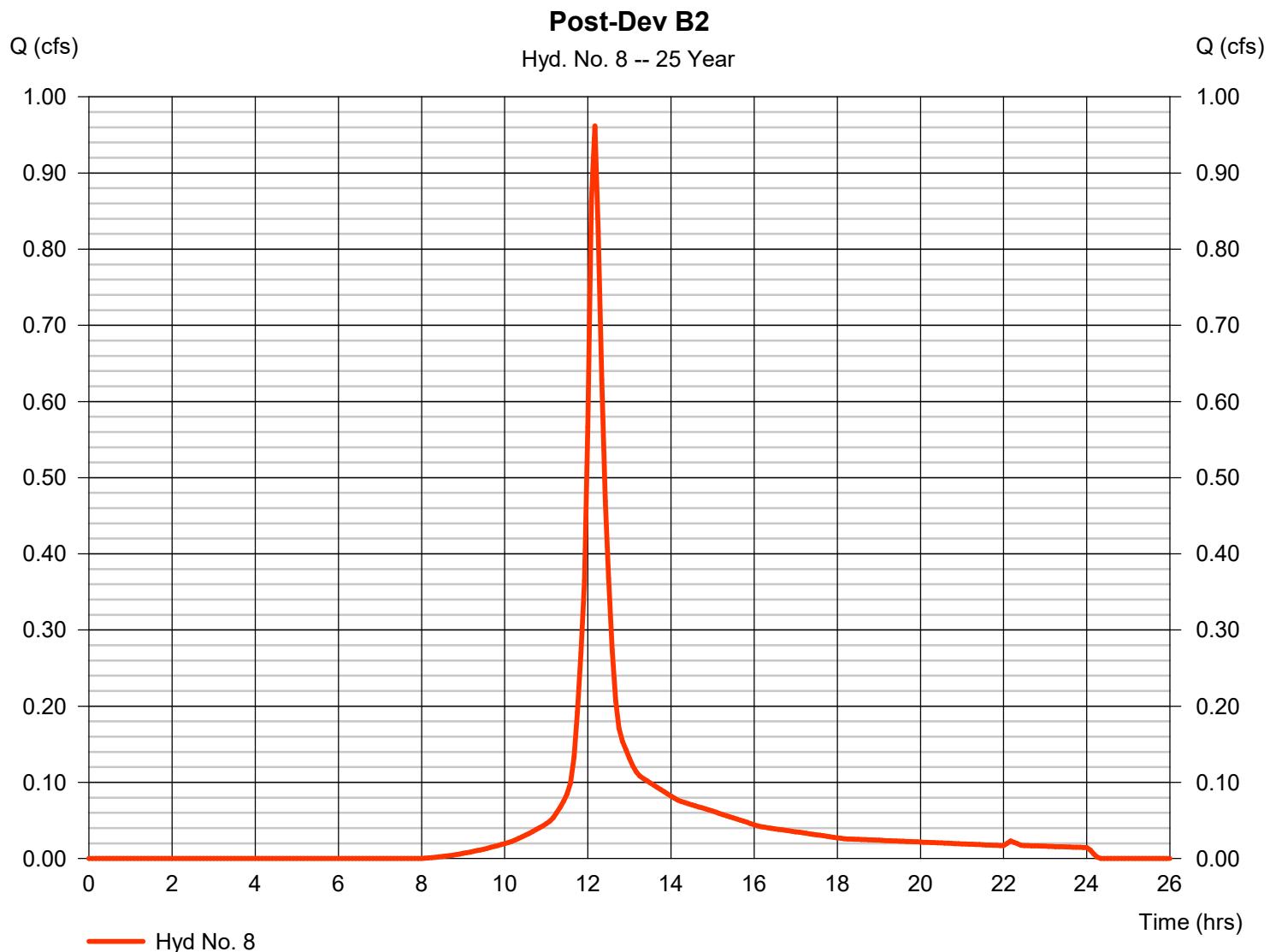


Hydrograph Report

Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.962 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 3,820 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

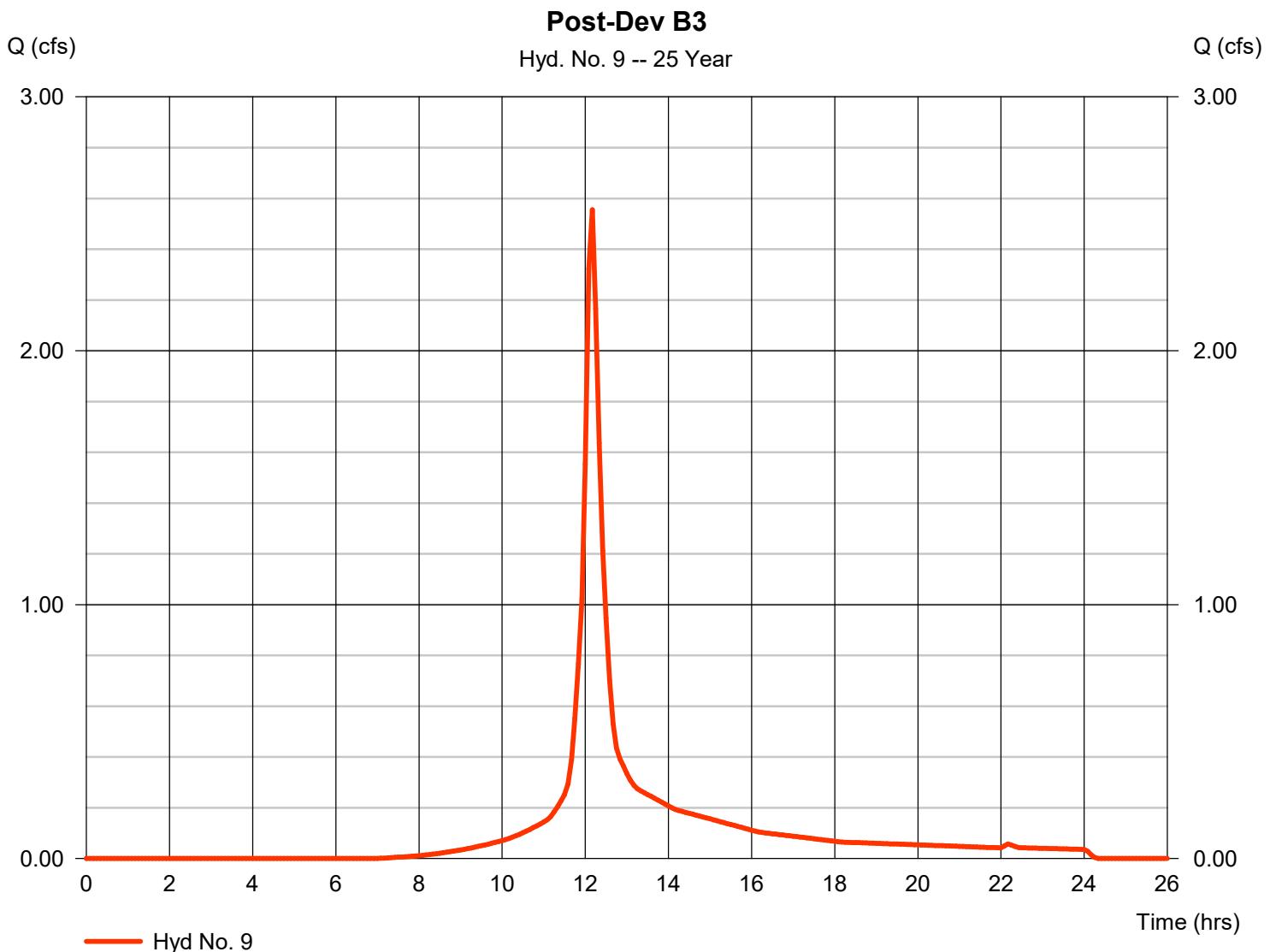


Hydrograph Report

Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.555 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 10,201 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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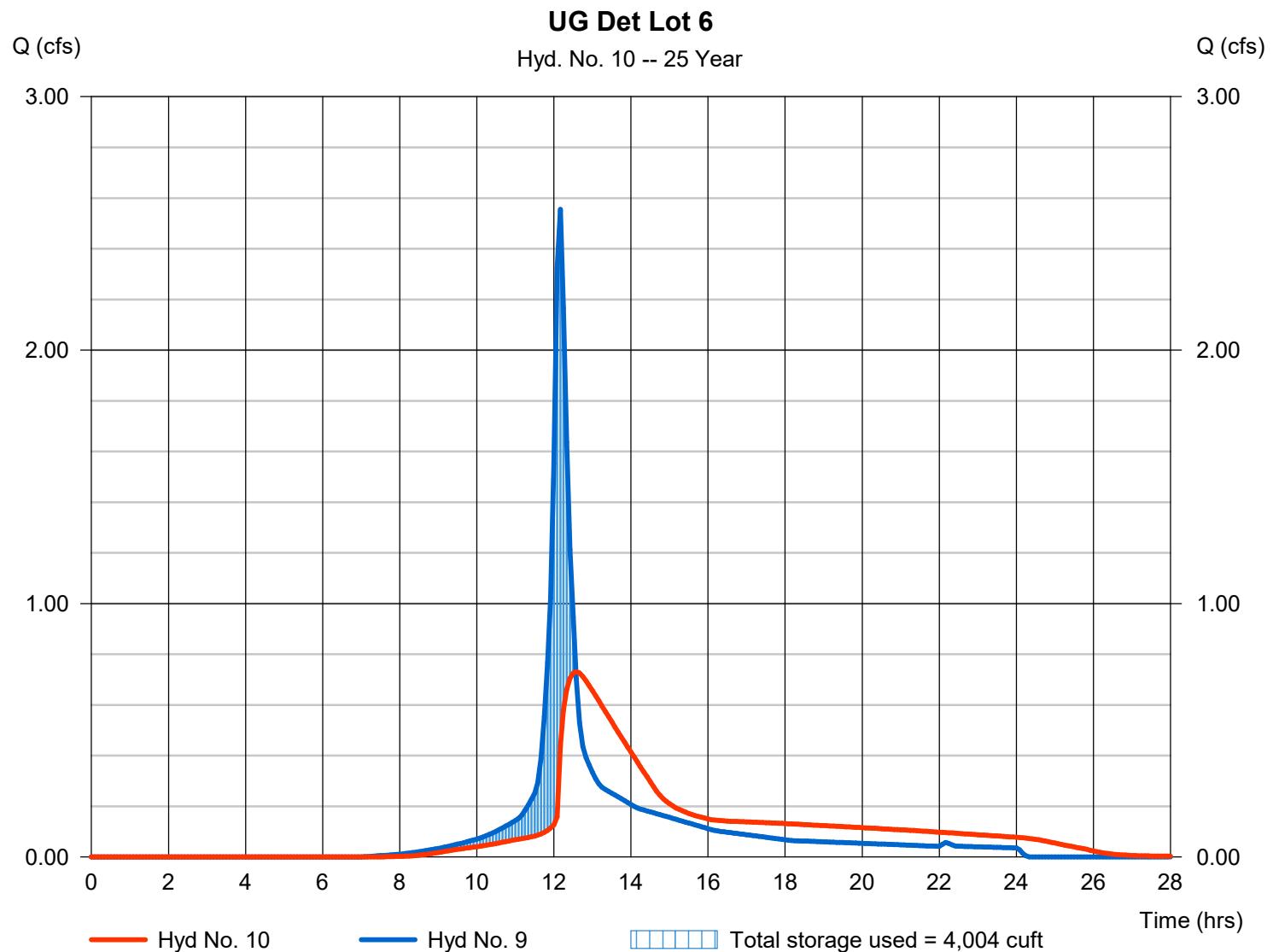
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 0.732 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.58 hrs
Time interval	= 5 min	Hyd. volume	= 10,194 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 307.58 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 4,004 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

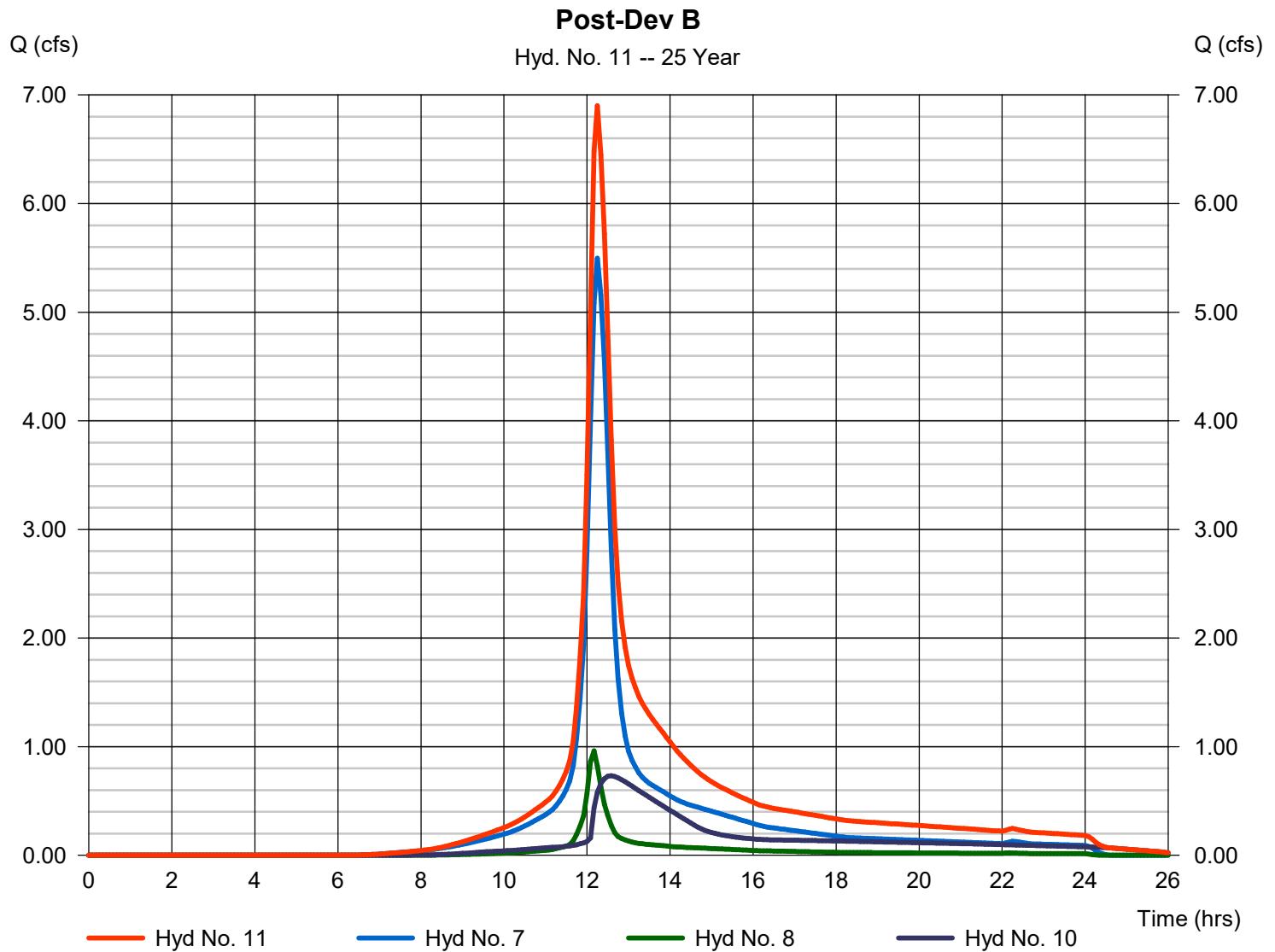
Monday, 07 / 1 / 2019

Hyd. No. 11

Post-Dev B

Hydrograph type = Combine
 Storm frequency = 25 yrs
 Time interval = 5 min
 Inflow hyds. = 7, 8, 10

Peak discharge = 6.901 cfs
 Time to peak = 12.25 hrs
 Hyd. volume = 40,523 cuft
 Contrib. drain. area = 2.082 ac



Hydrograph Report

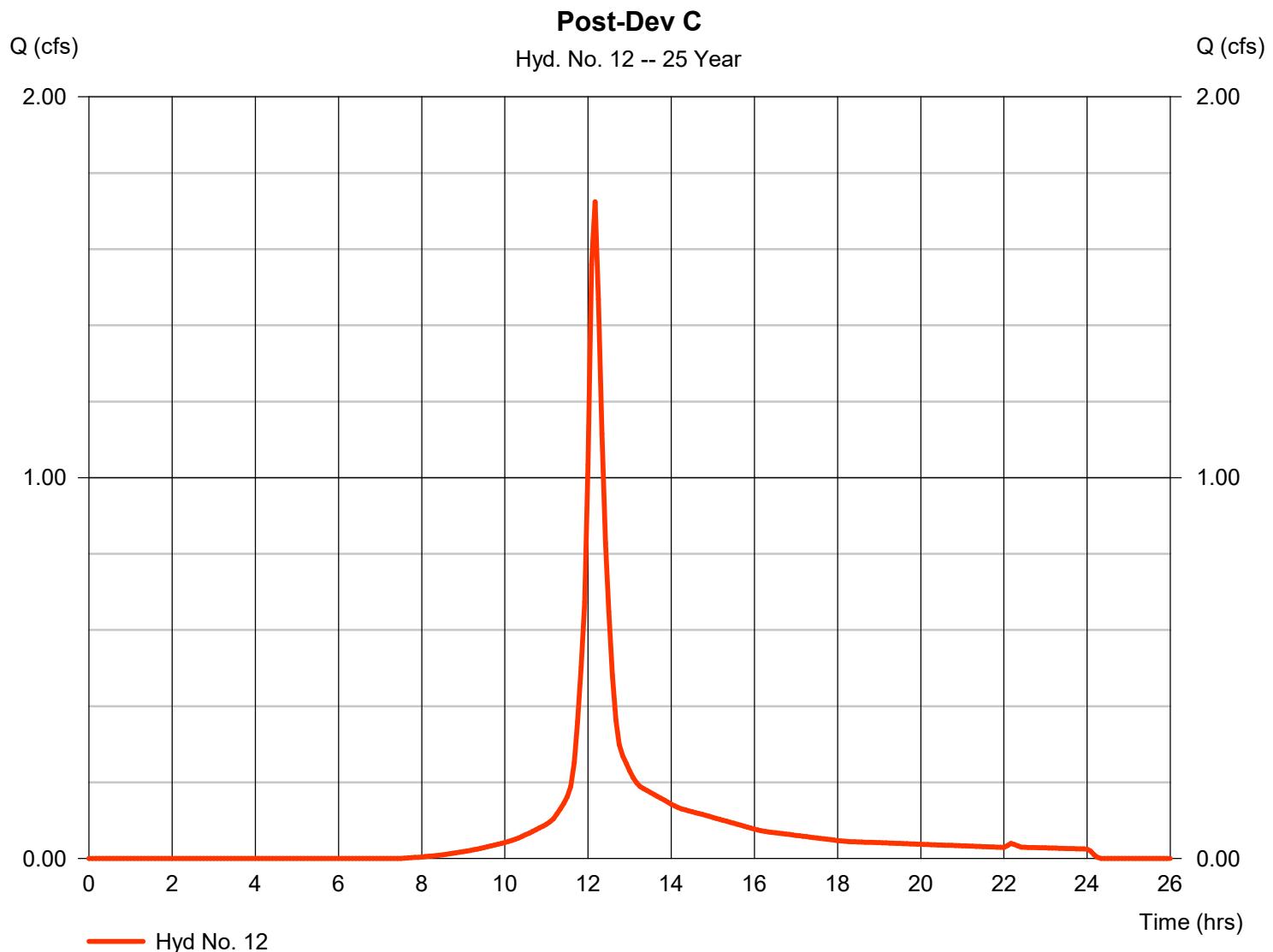
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Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 1.725 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 6,863 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.33 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

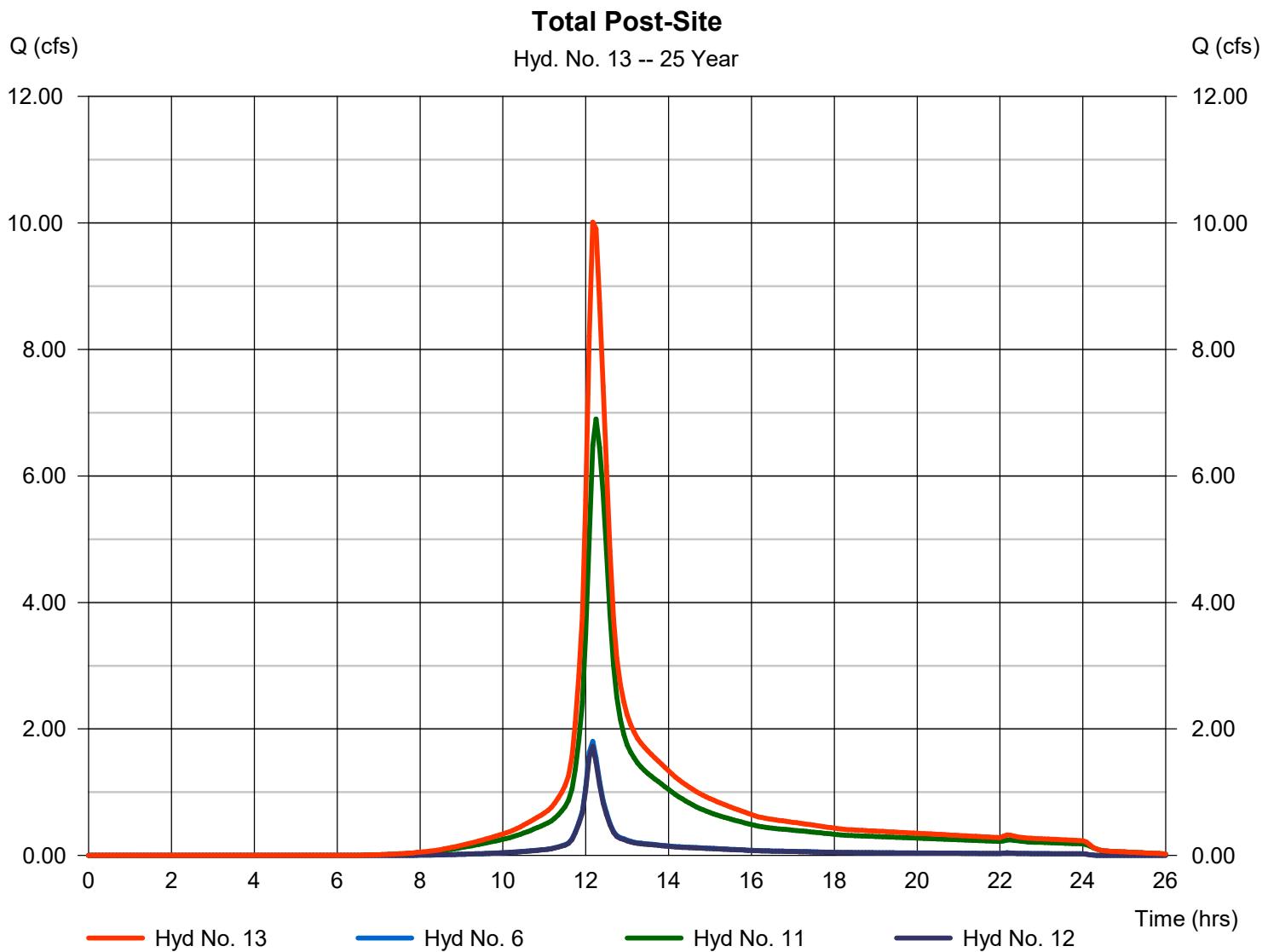
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Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 10.01 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 54,566 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac

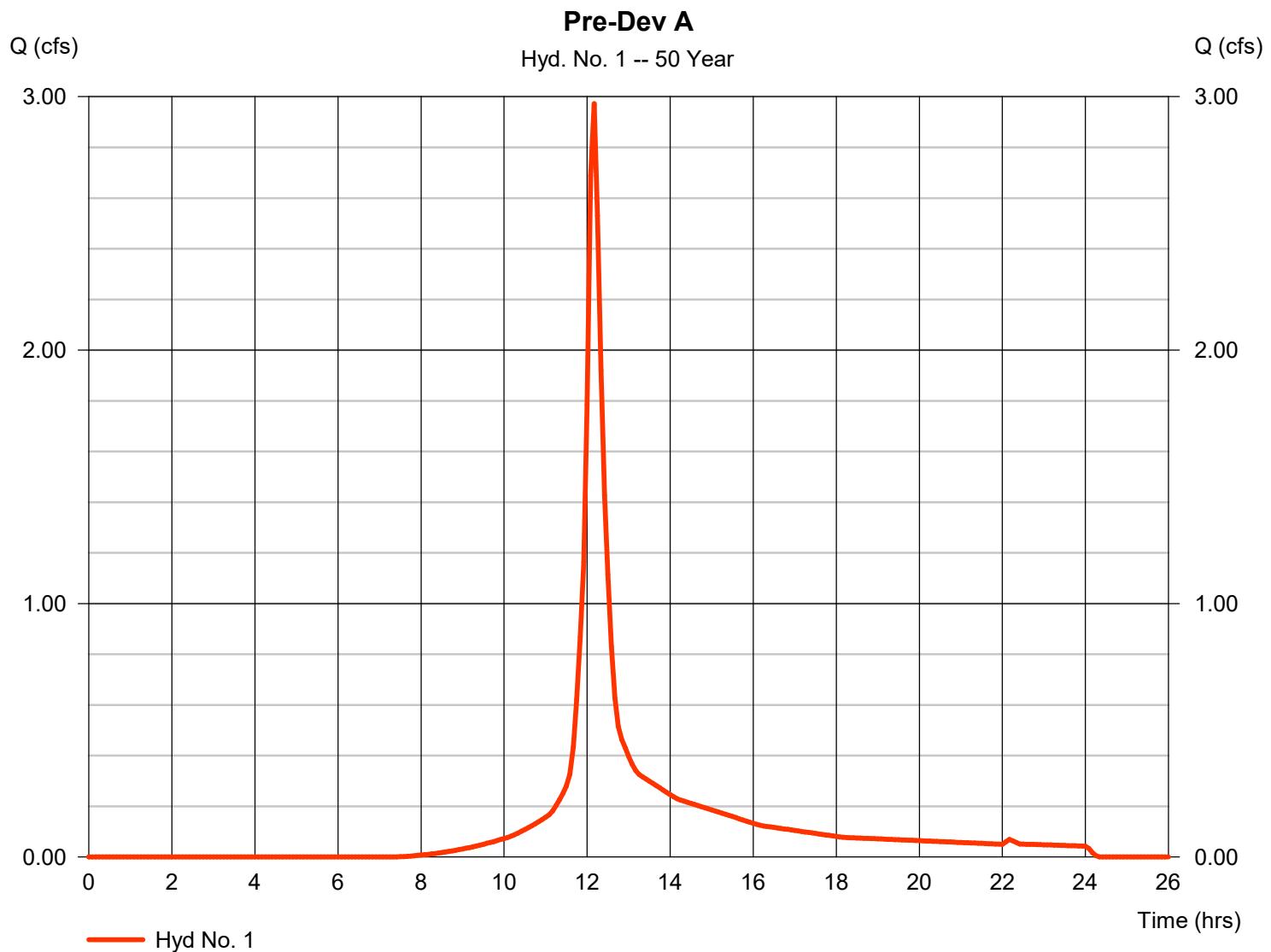


Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.973 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 11,832 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

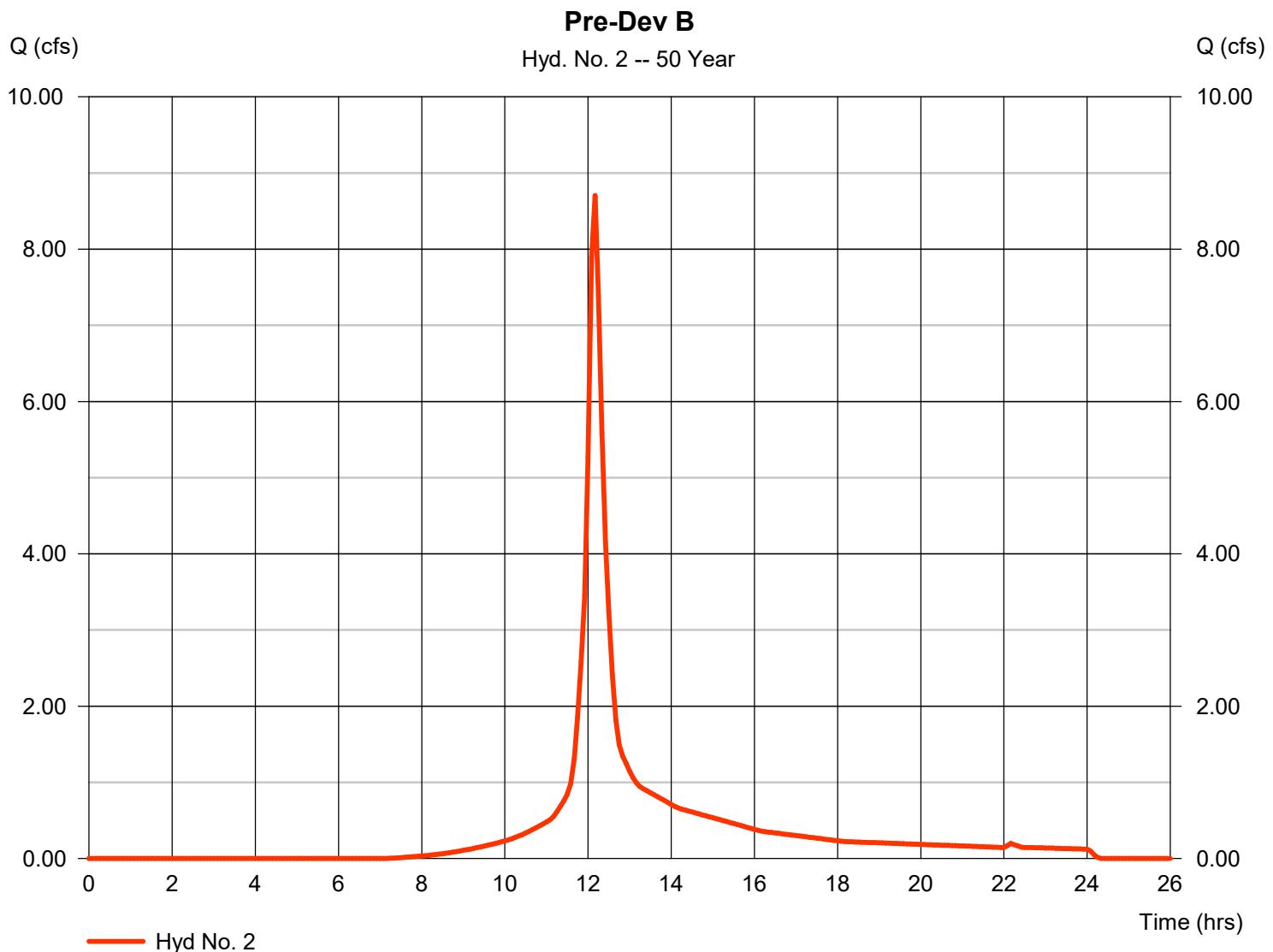


Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 8.704 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 34,706 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

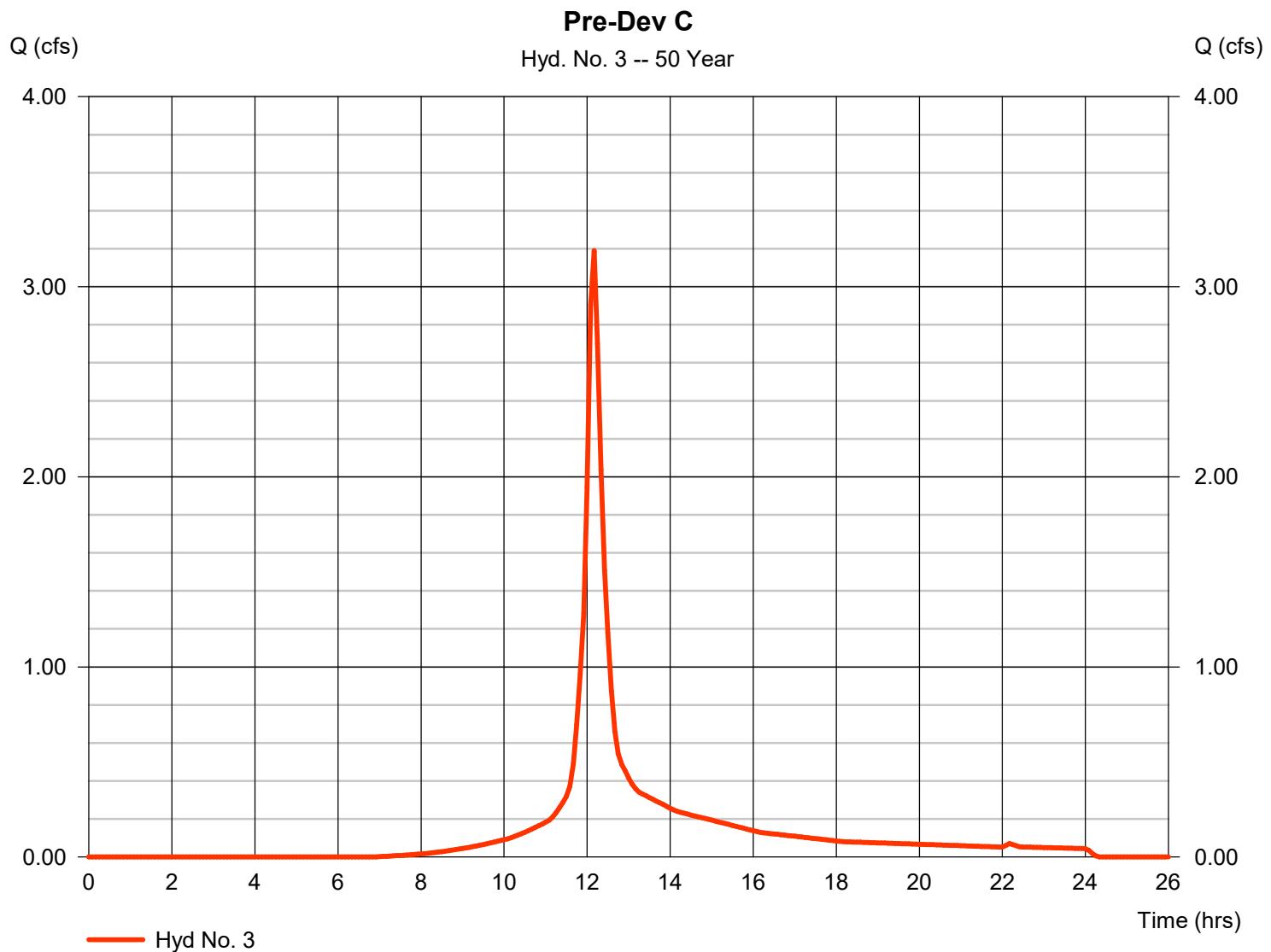


Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 3.190 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 12,750 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

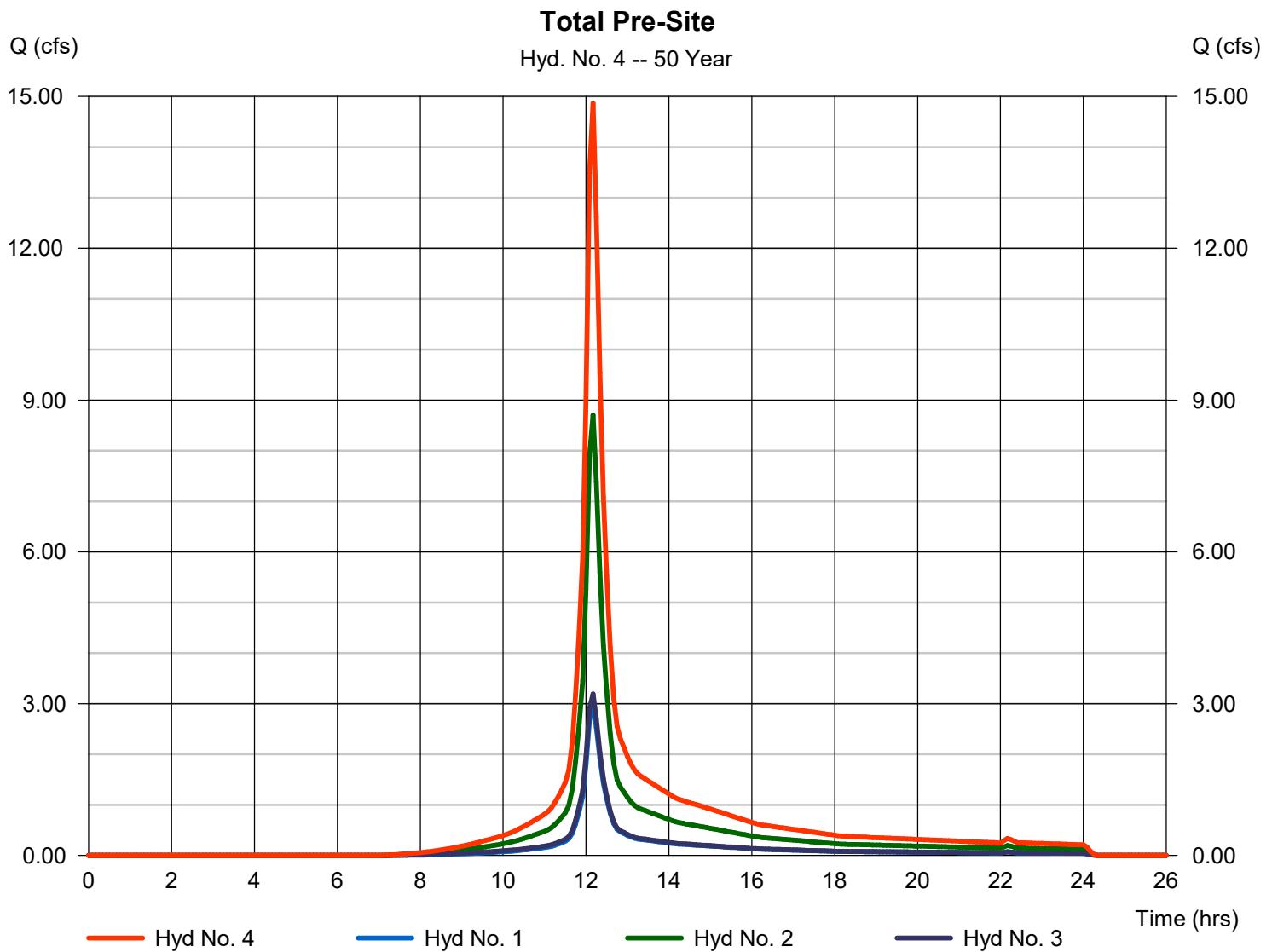
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 14.87 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 59,289 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac

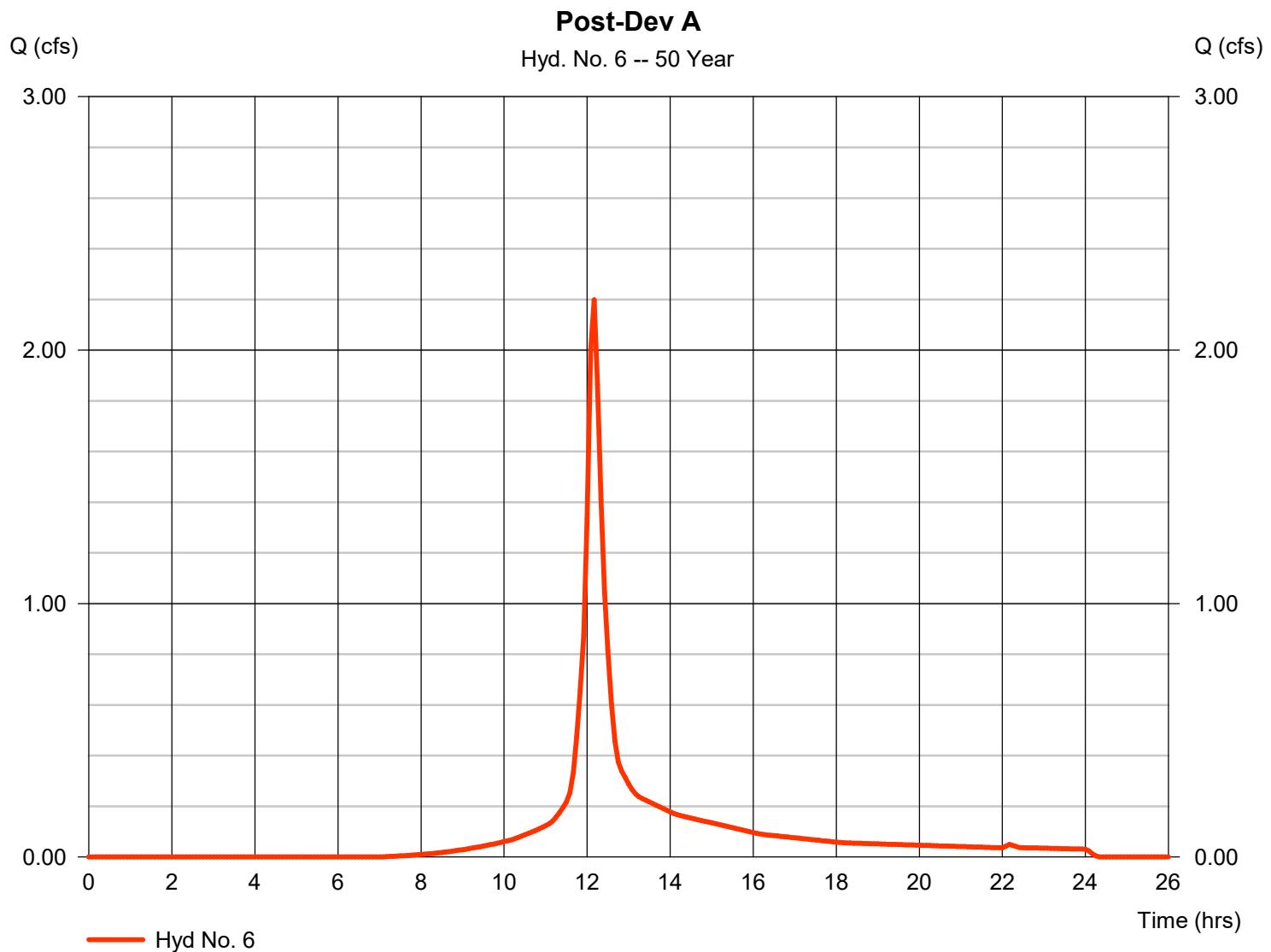


Hydrograph Report

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.199 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 8,776 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

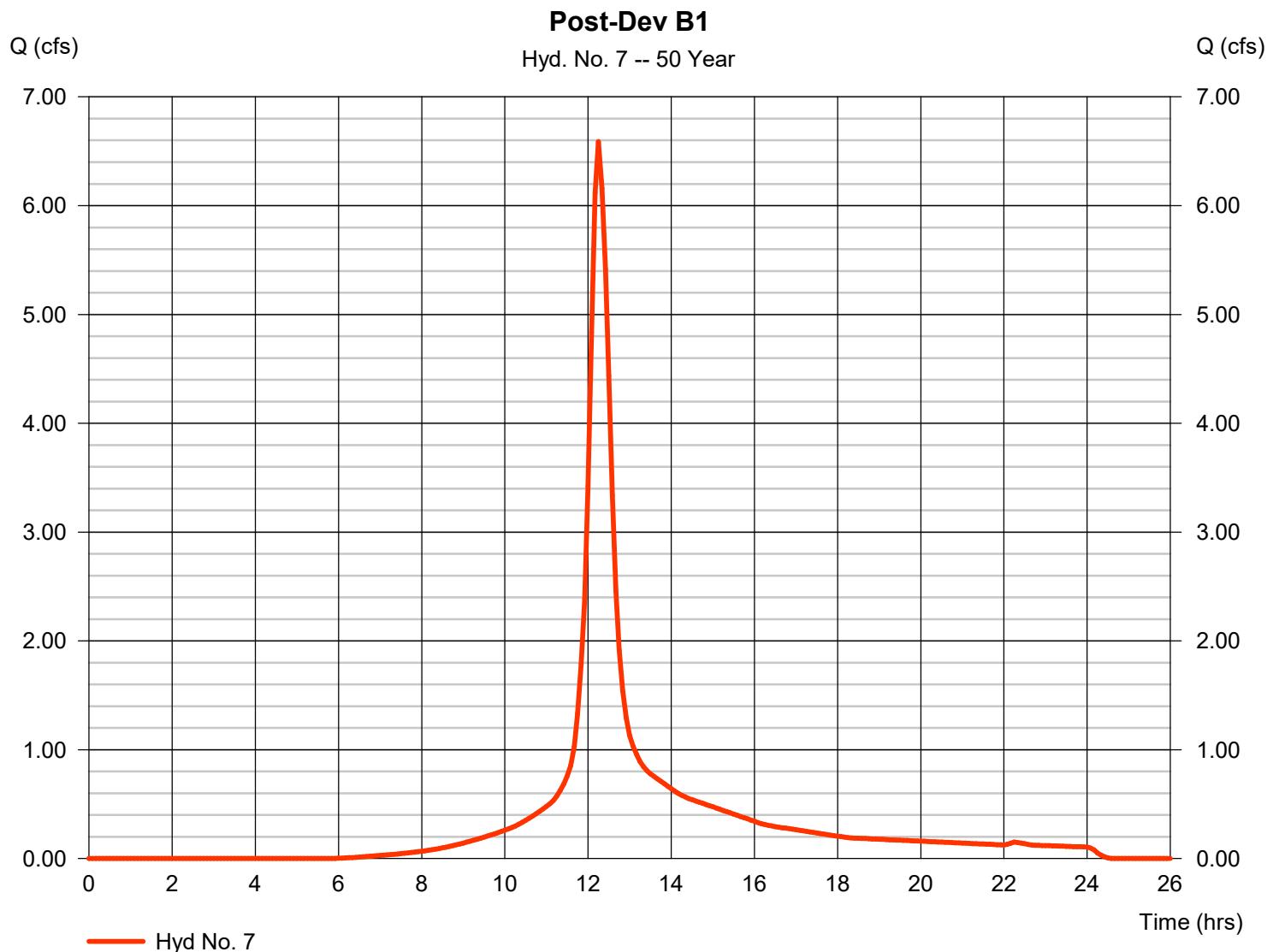
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 6.589 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 31,935 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

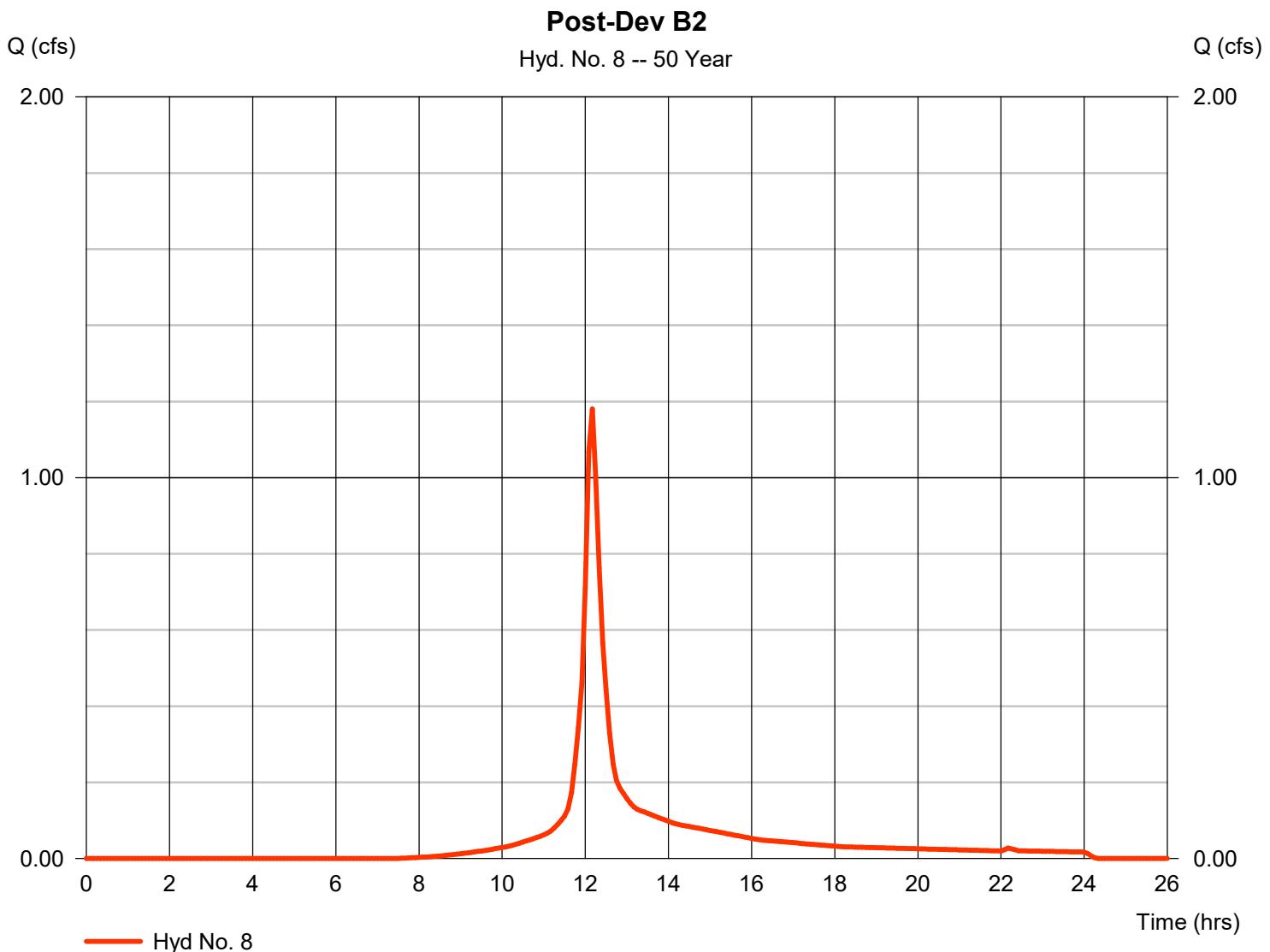


Hydrograph Report

Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.180 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 4,698 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

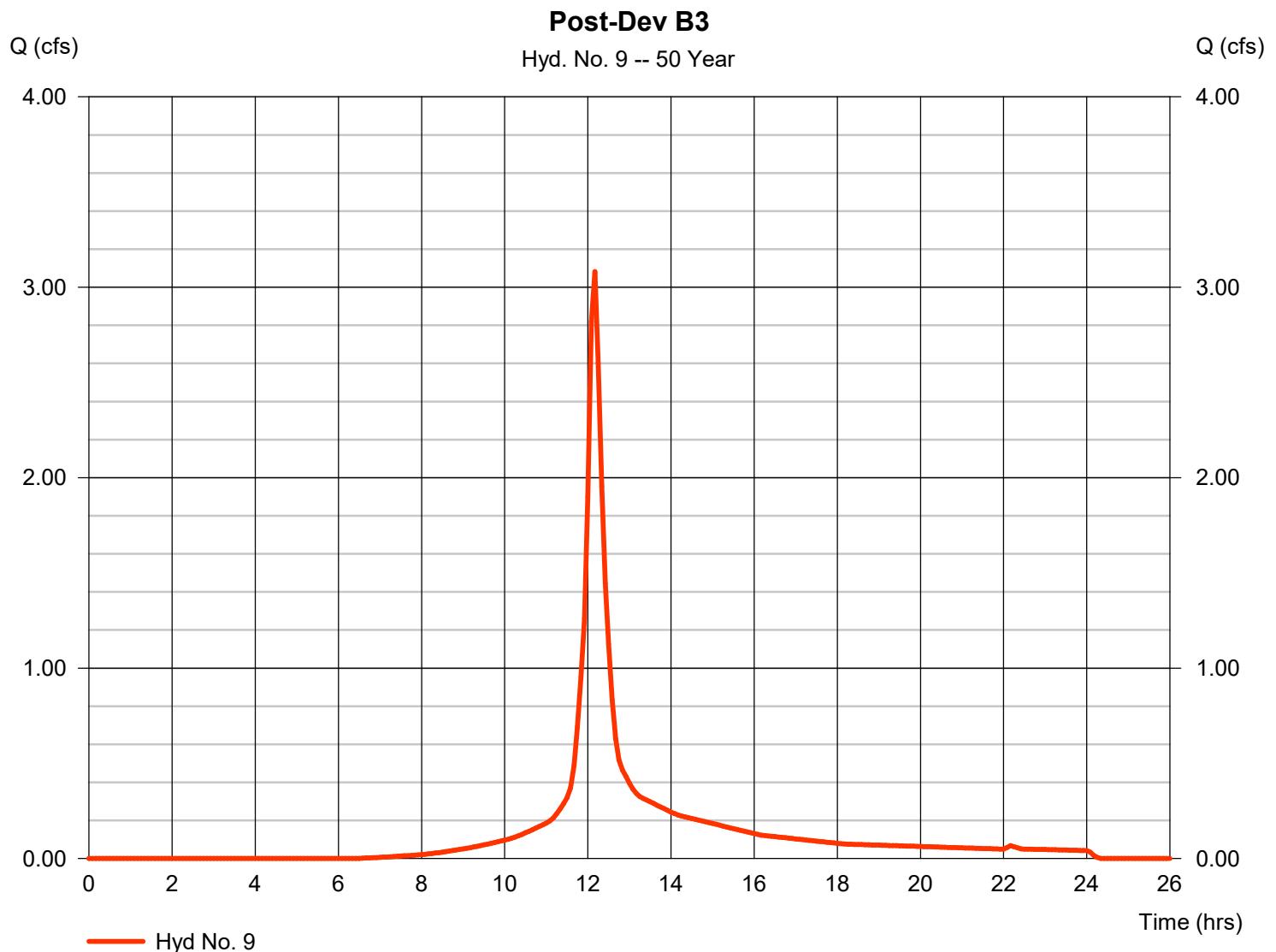
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.083 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 12,374 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

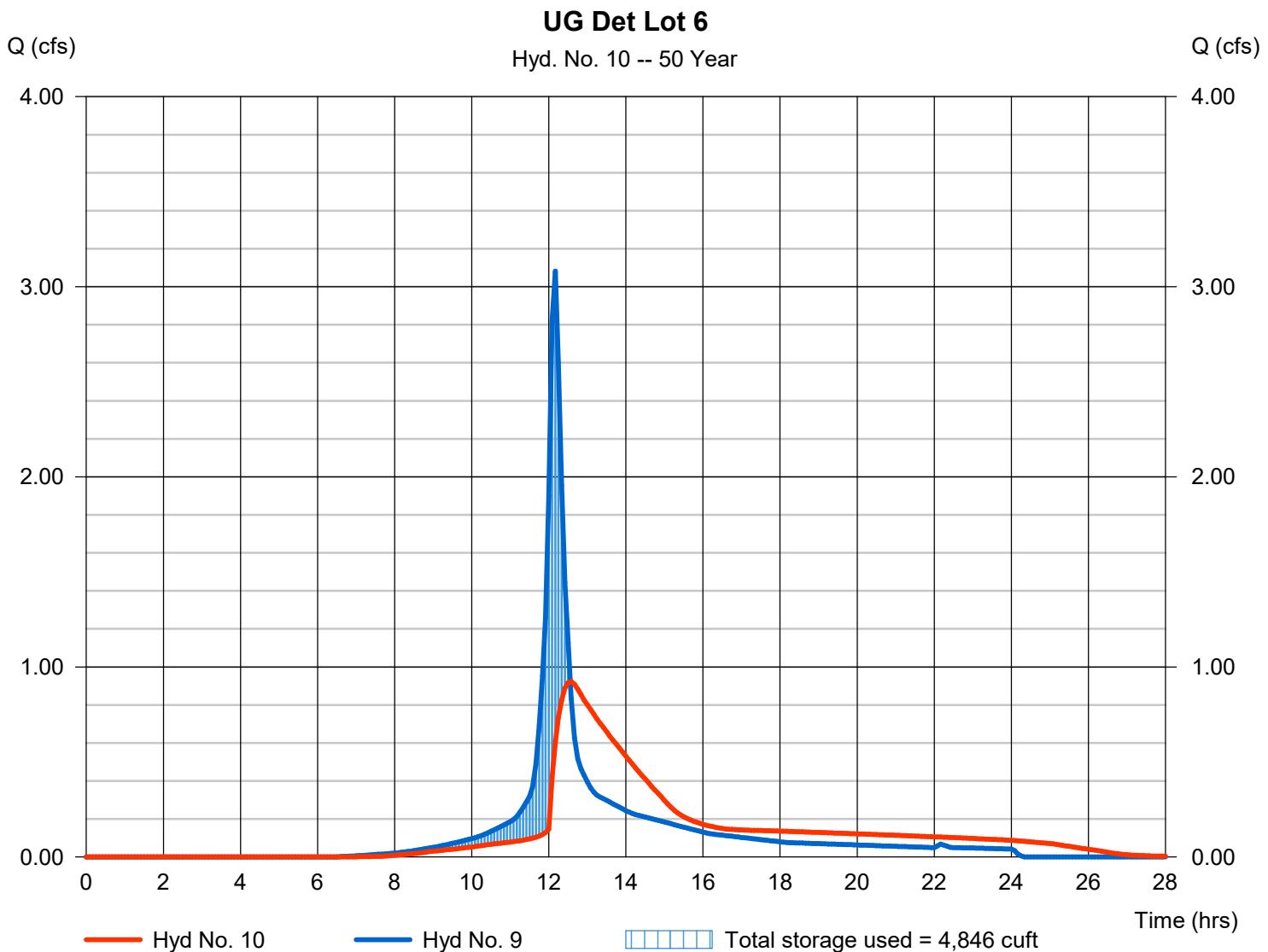
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 0.923 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.58 hrs
Time interval	= 5 min	Hyd. volume	= 12,367 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 308.74 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 4,846 cuft

Storage Indication method used.



Hydrograph Report

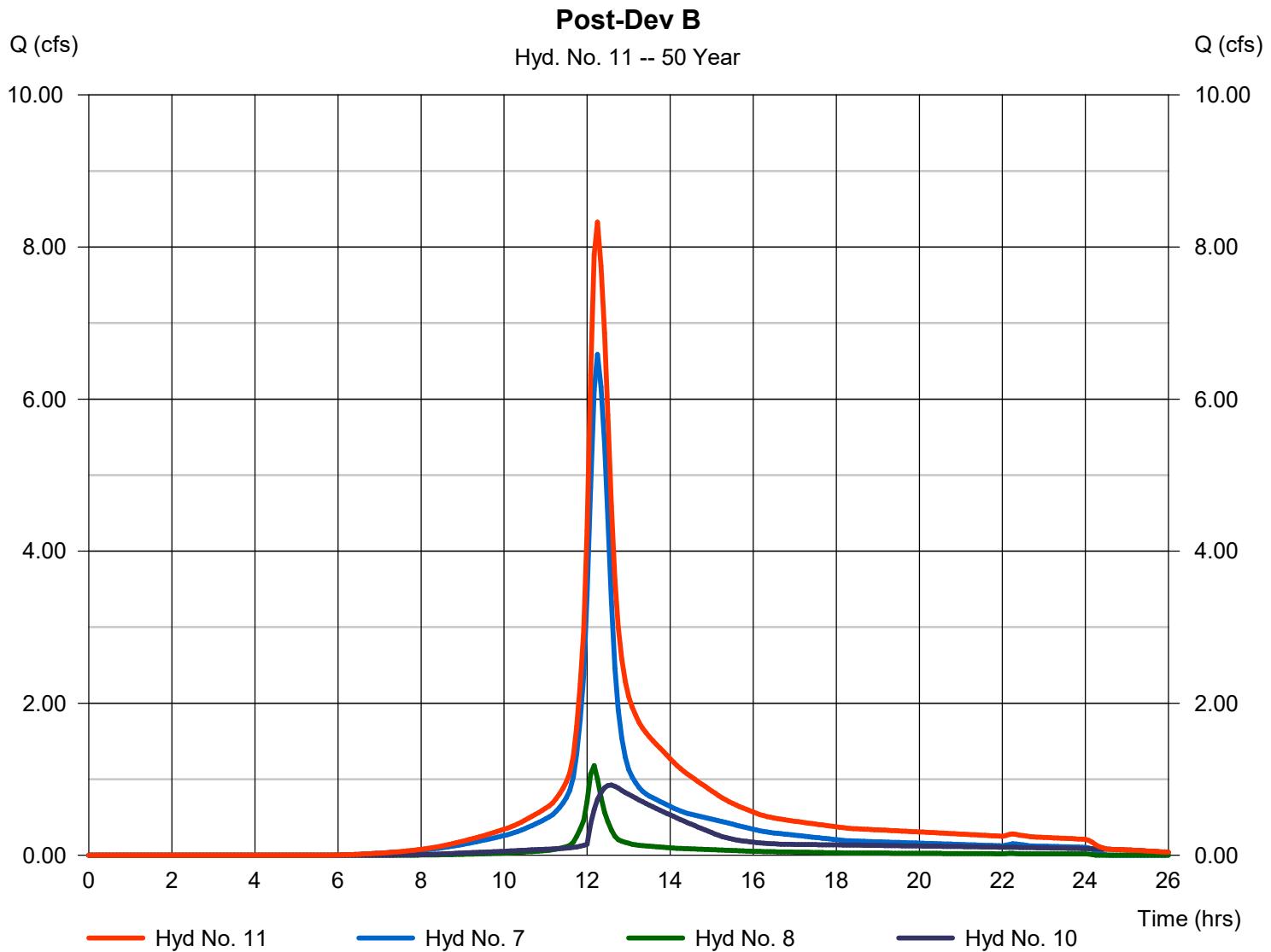
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 11

Post-Dev B

Hydrograph type	= Combine	Peak discharge	= 8.327 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 49,000 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 2.082 ac

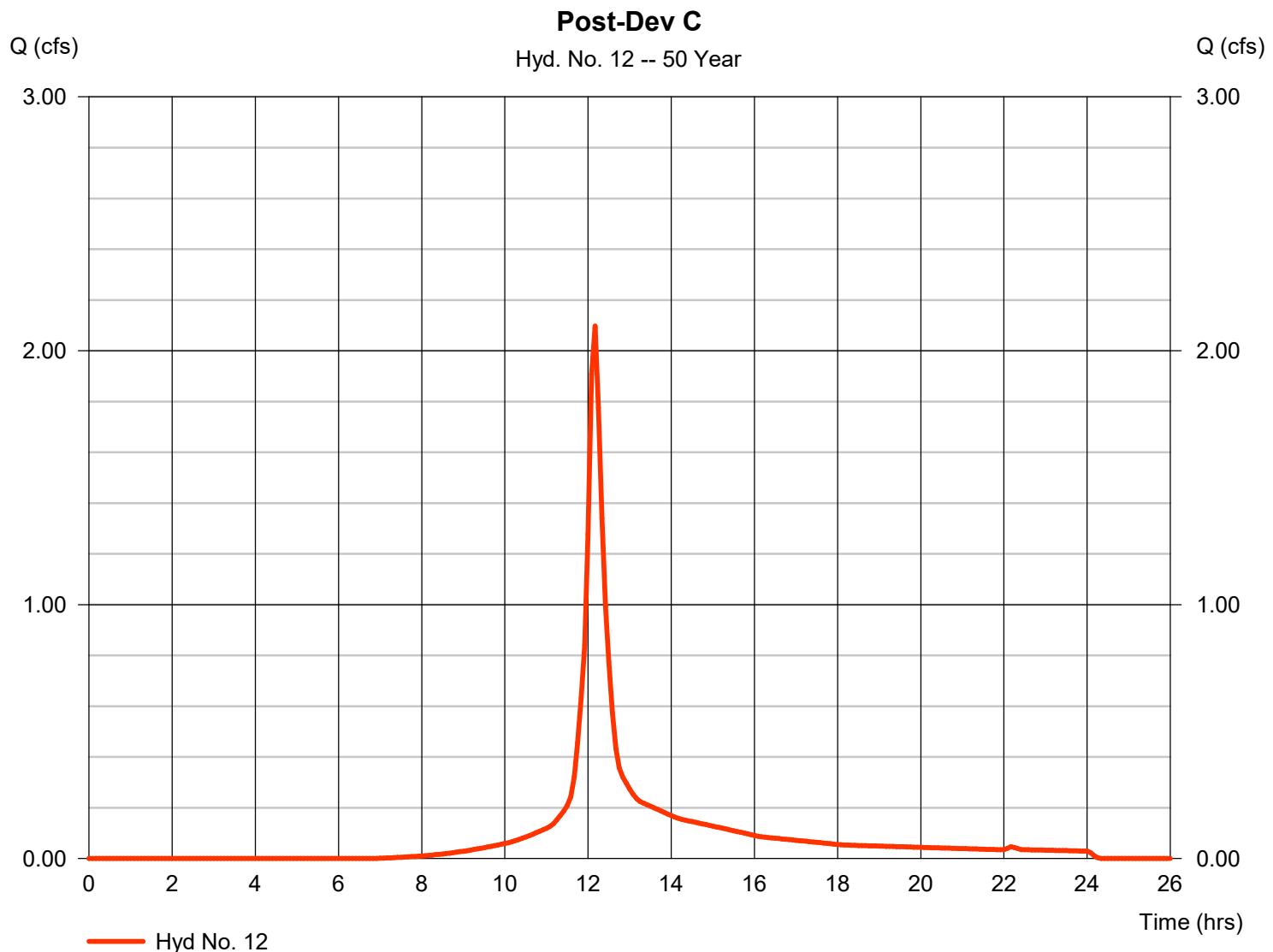


Hydrograph Report

Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.097 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 8,377 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 7.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

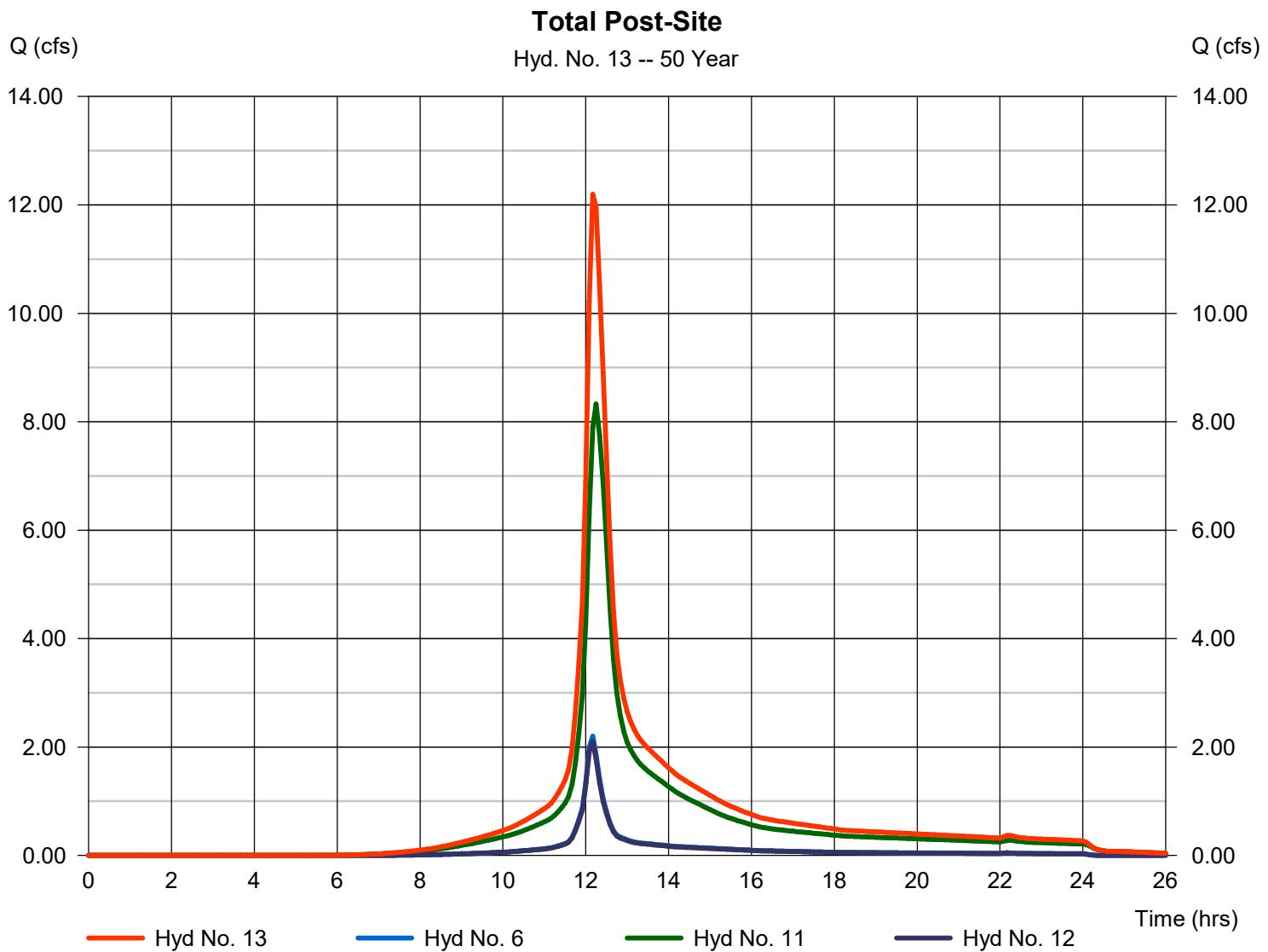
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 12.20 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 66,153 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac

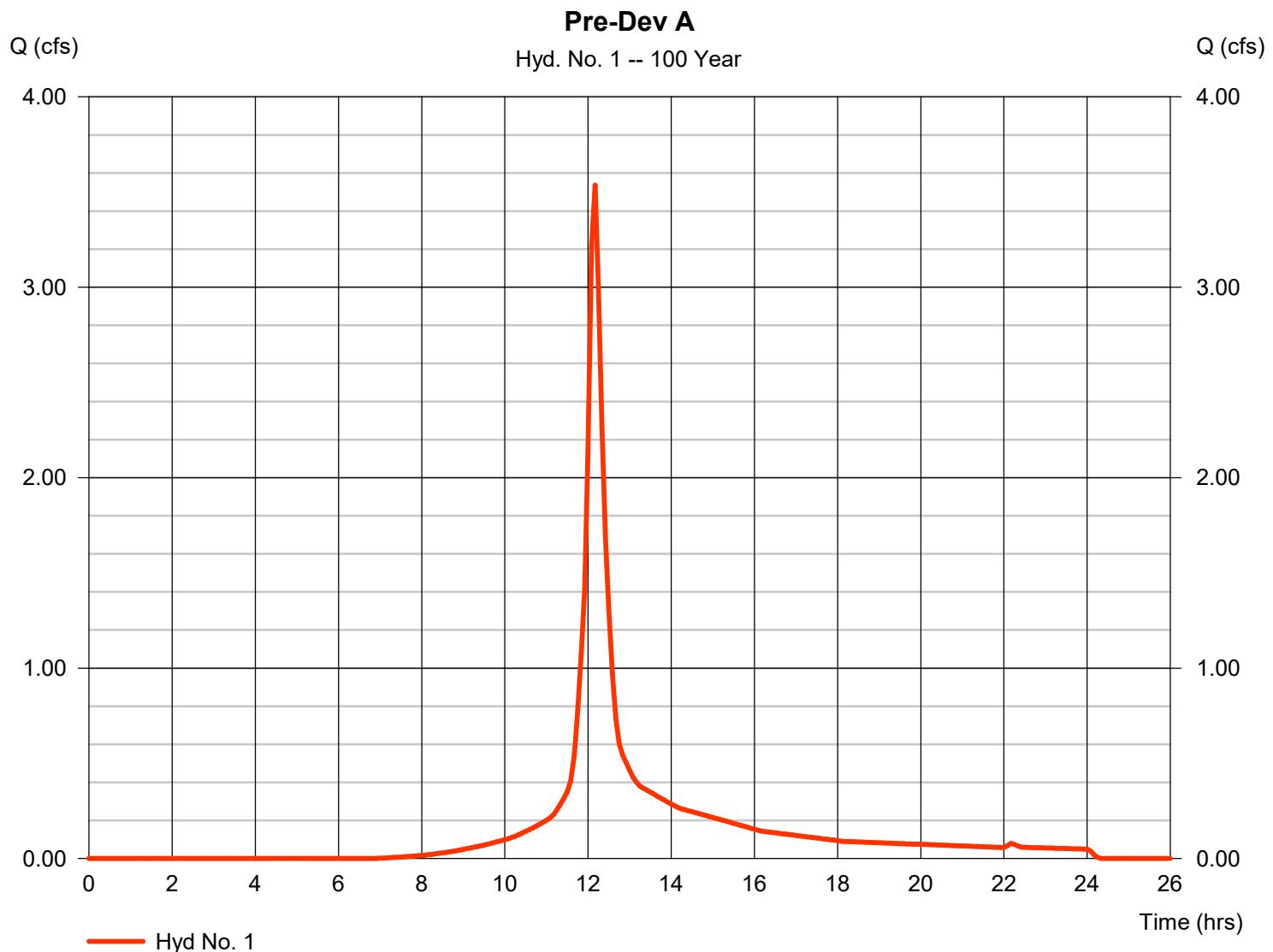


Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.537 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 14,126 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

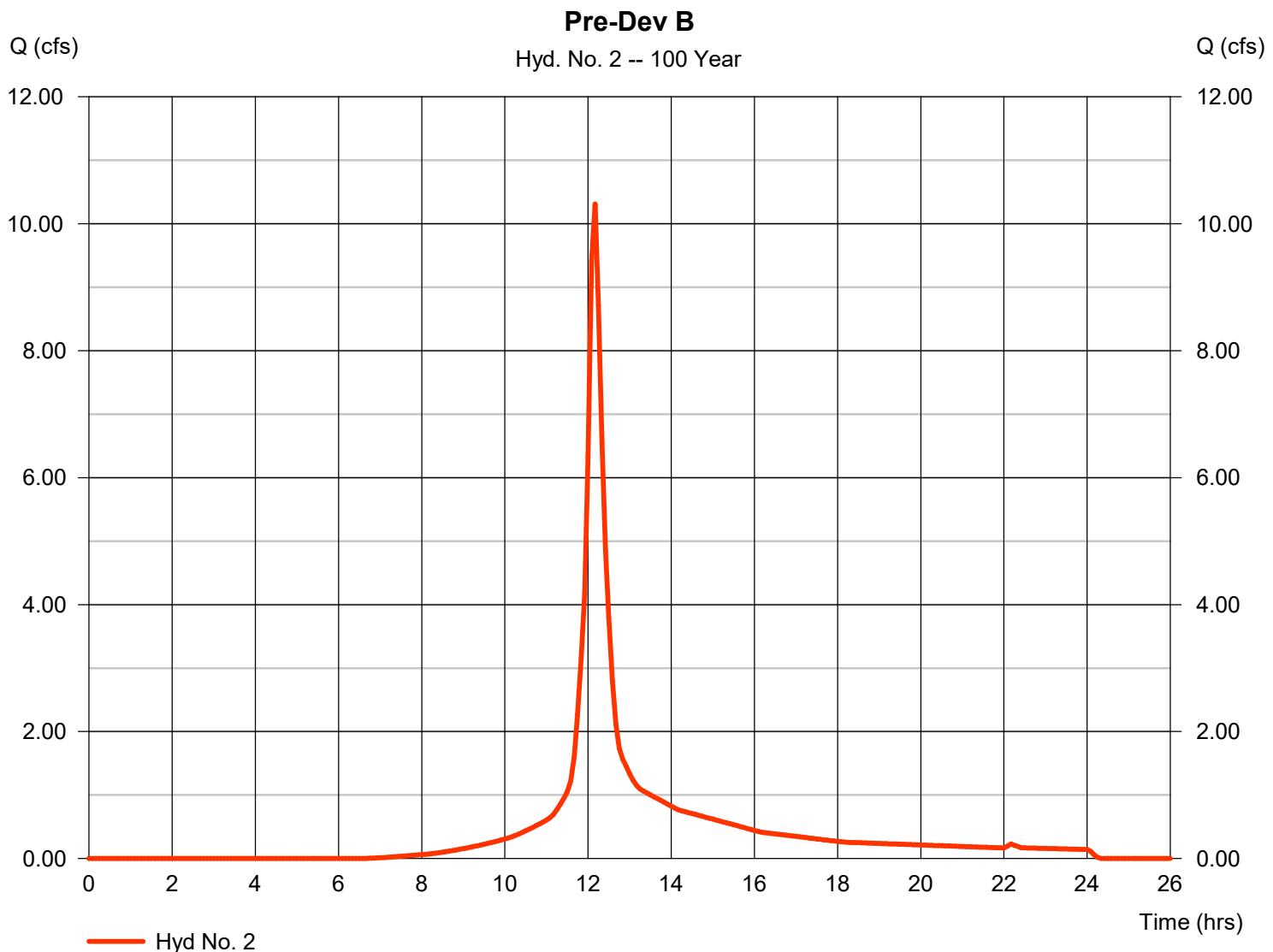


Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 10.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 41,297 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

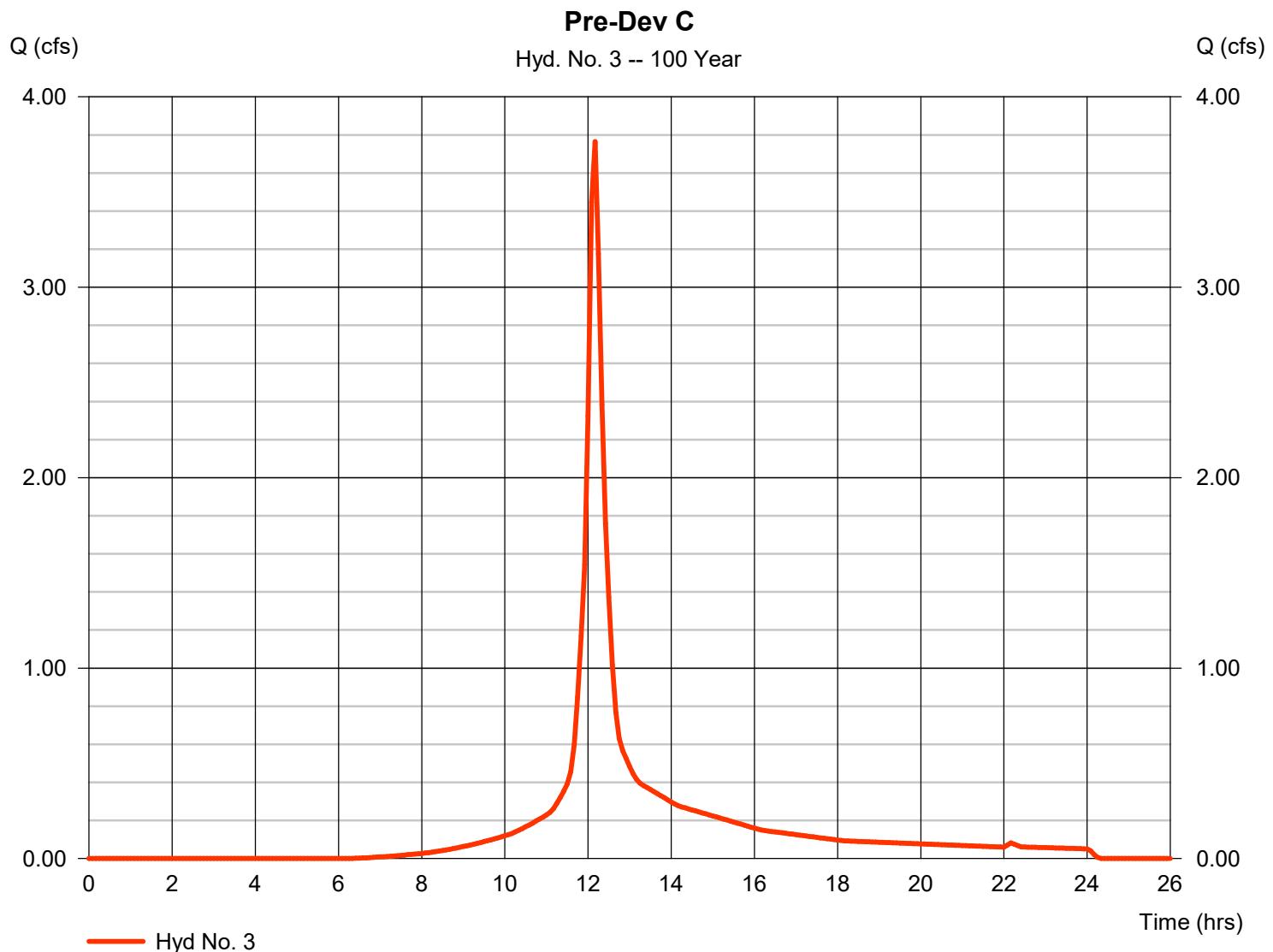


Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 3.765 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 15,122 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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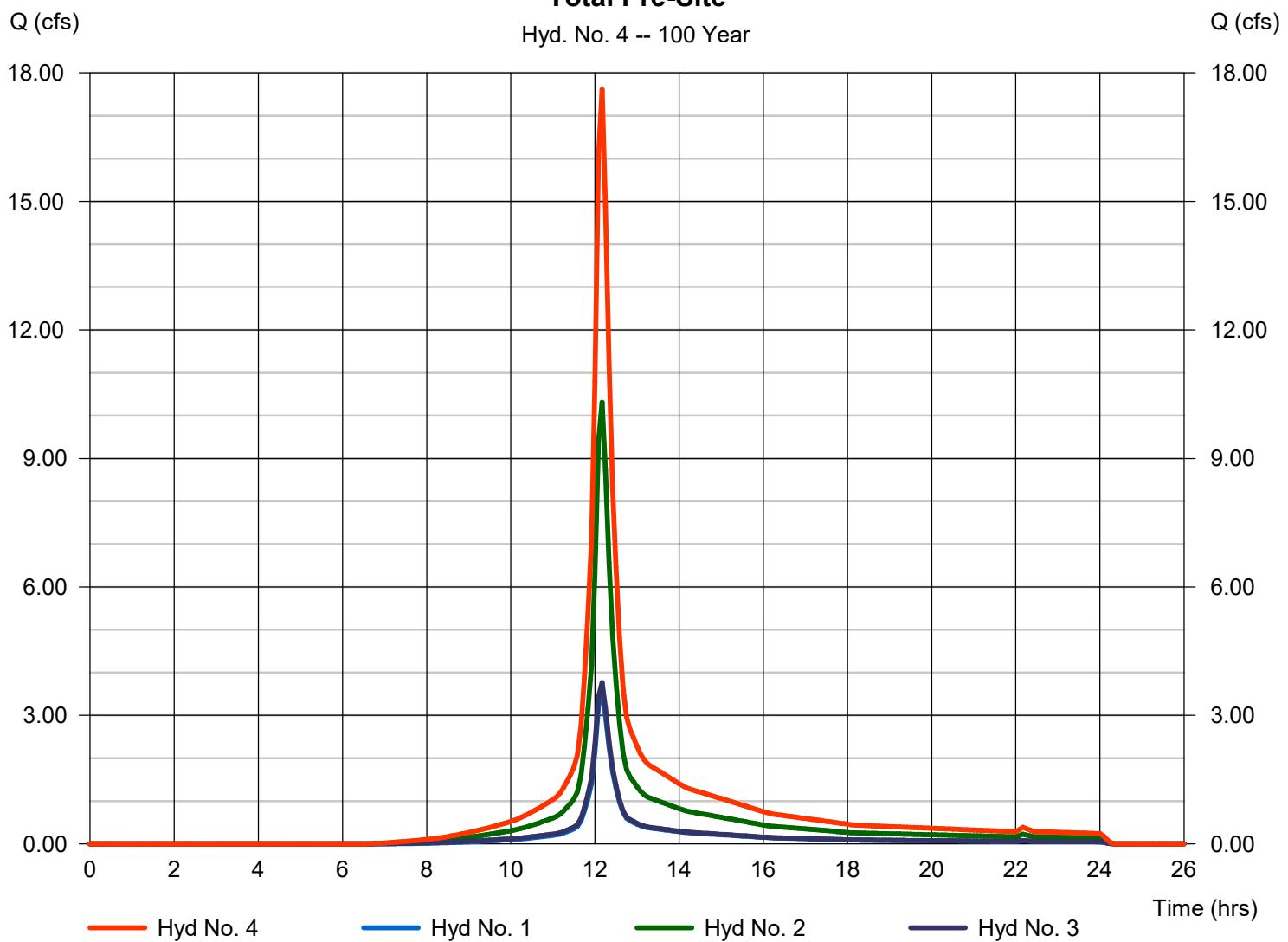
Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 17.61 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 70,545 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac

Total Pre-Site

Hyd. No. 4 -- 100 Year

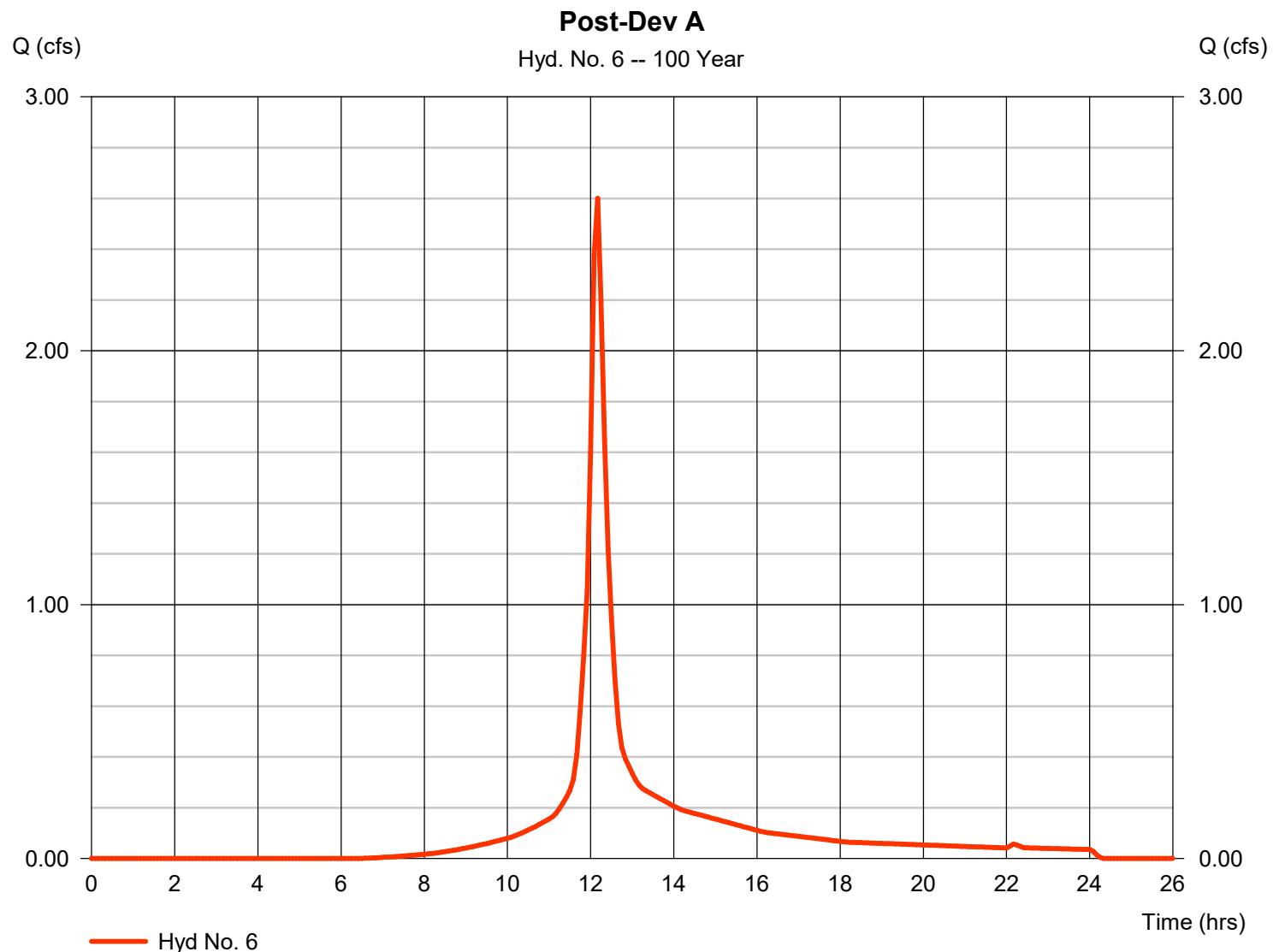


Hydrograph Report

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.600 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 10,427 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

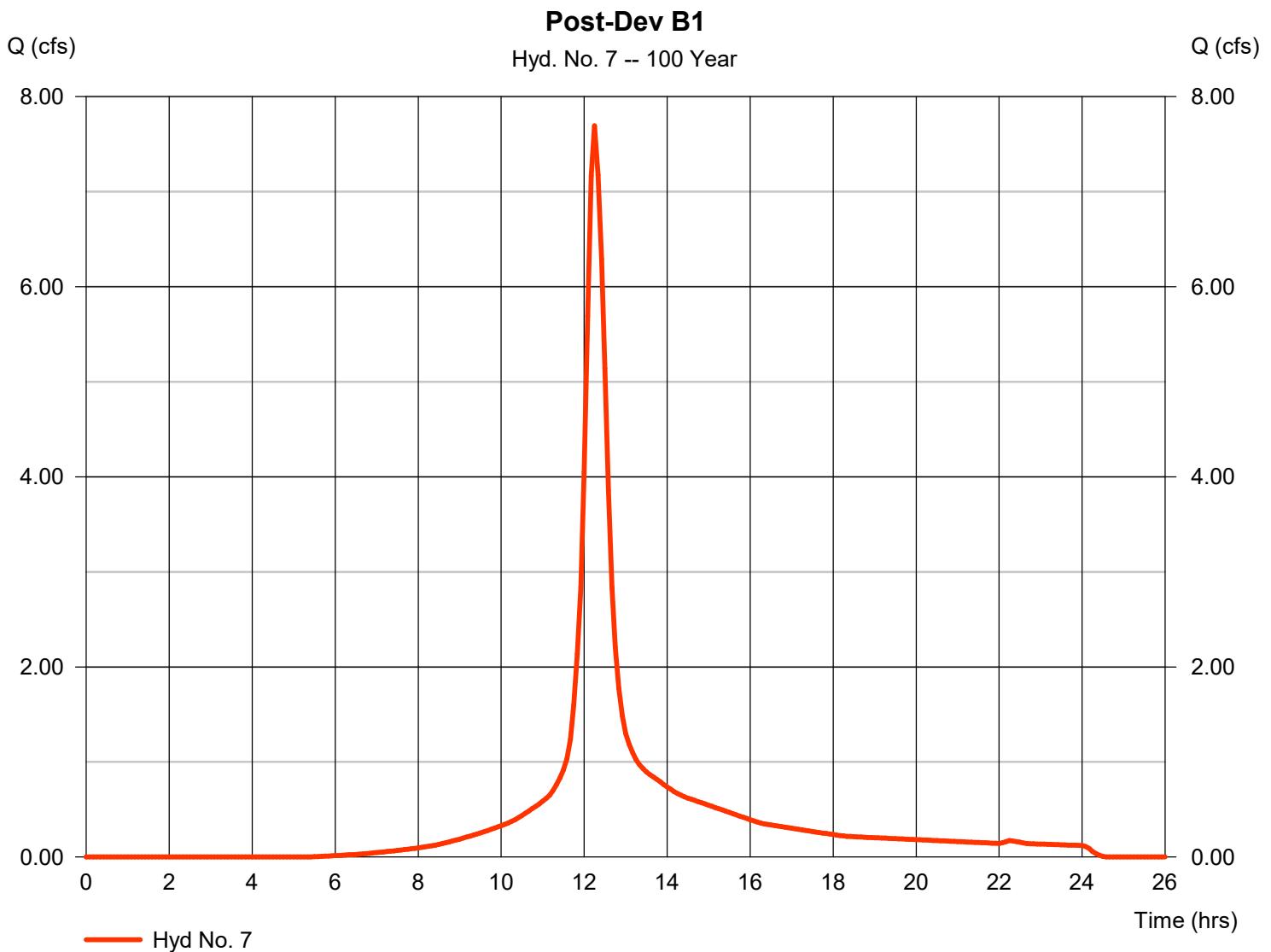


Hydrograph Report

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 7.695 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 37,503 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

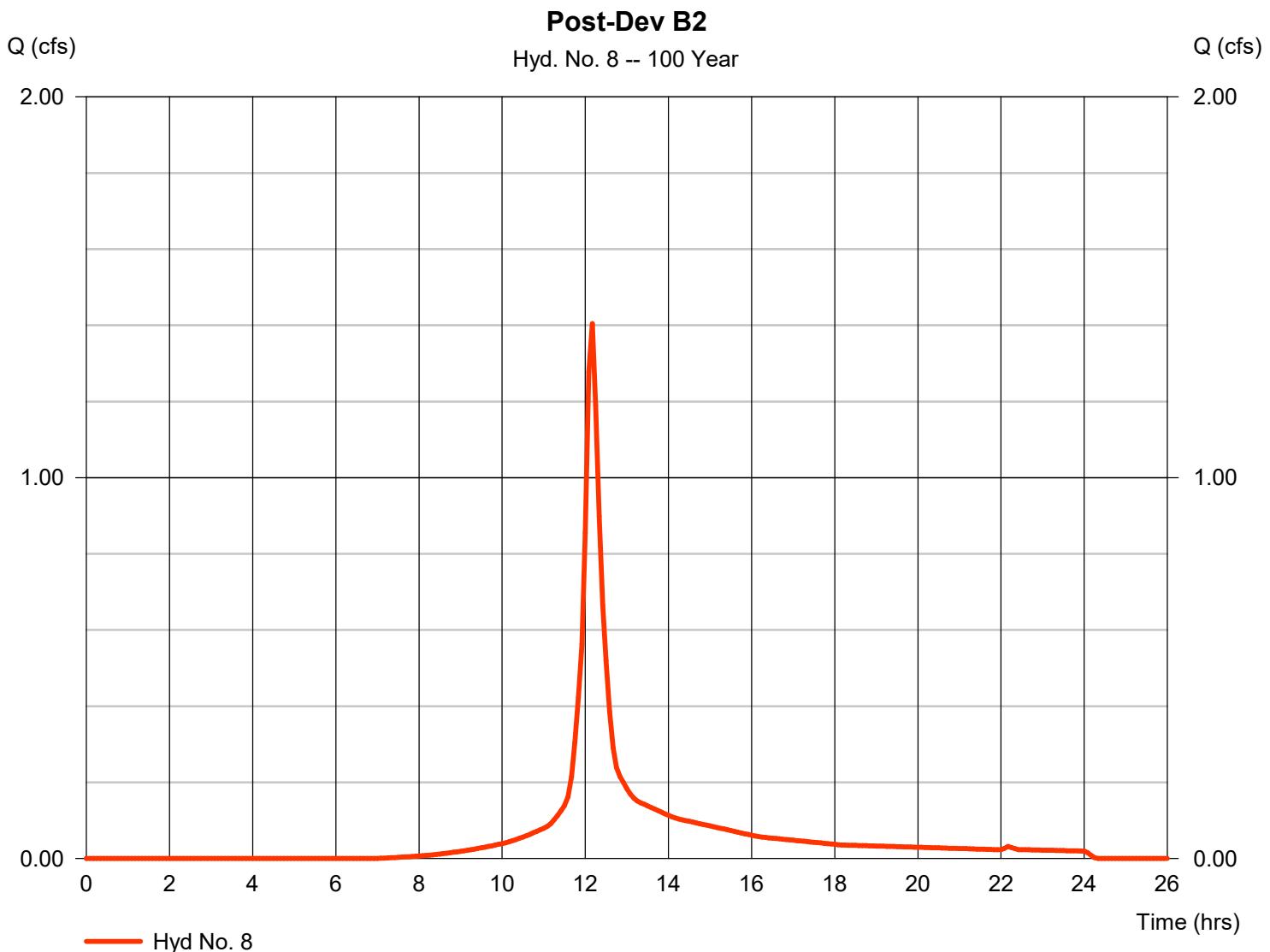
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.404 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 5,609 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

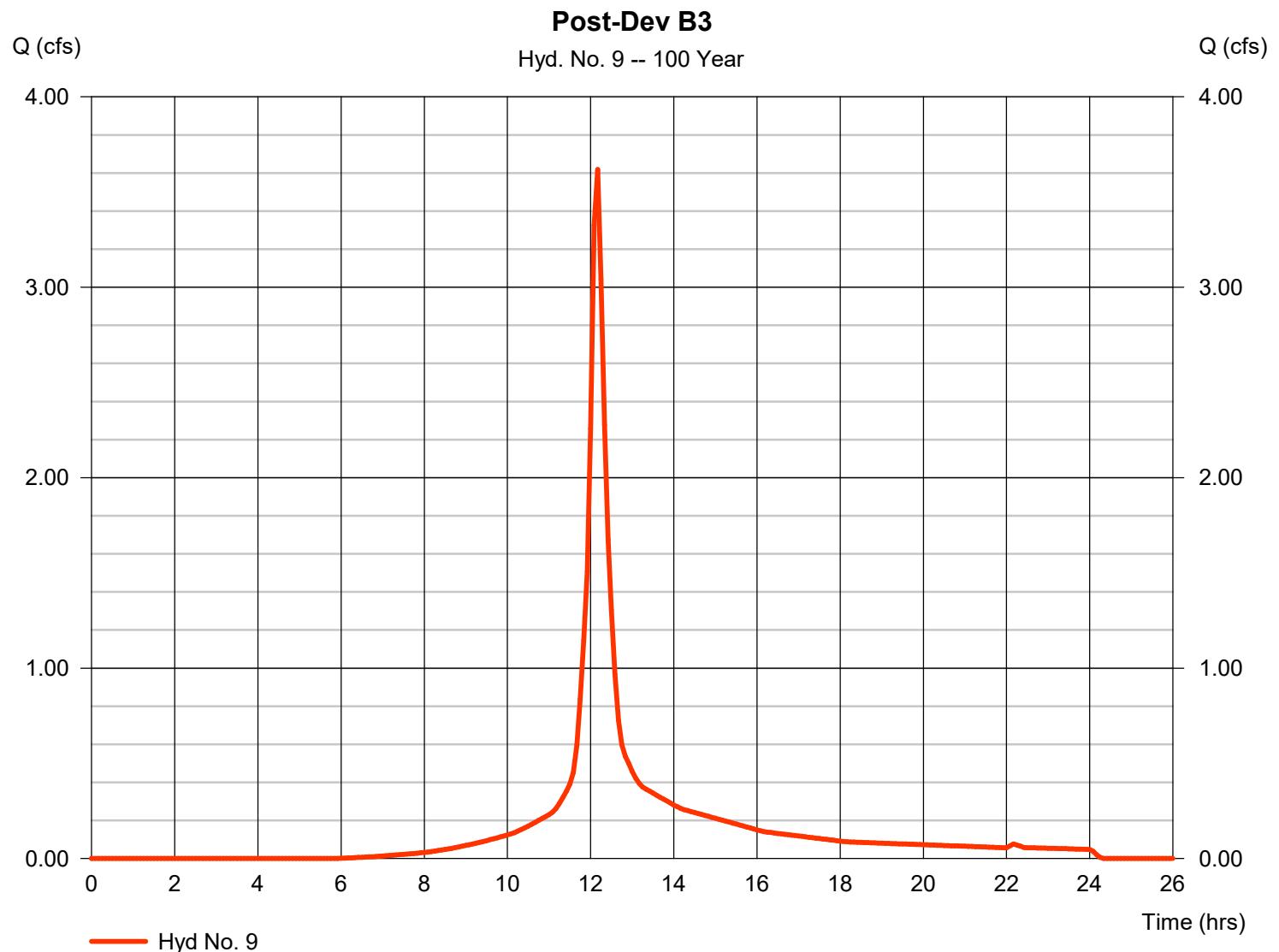
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.619 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 14,611 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

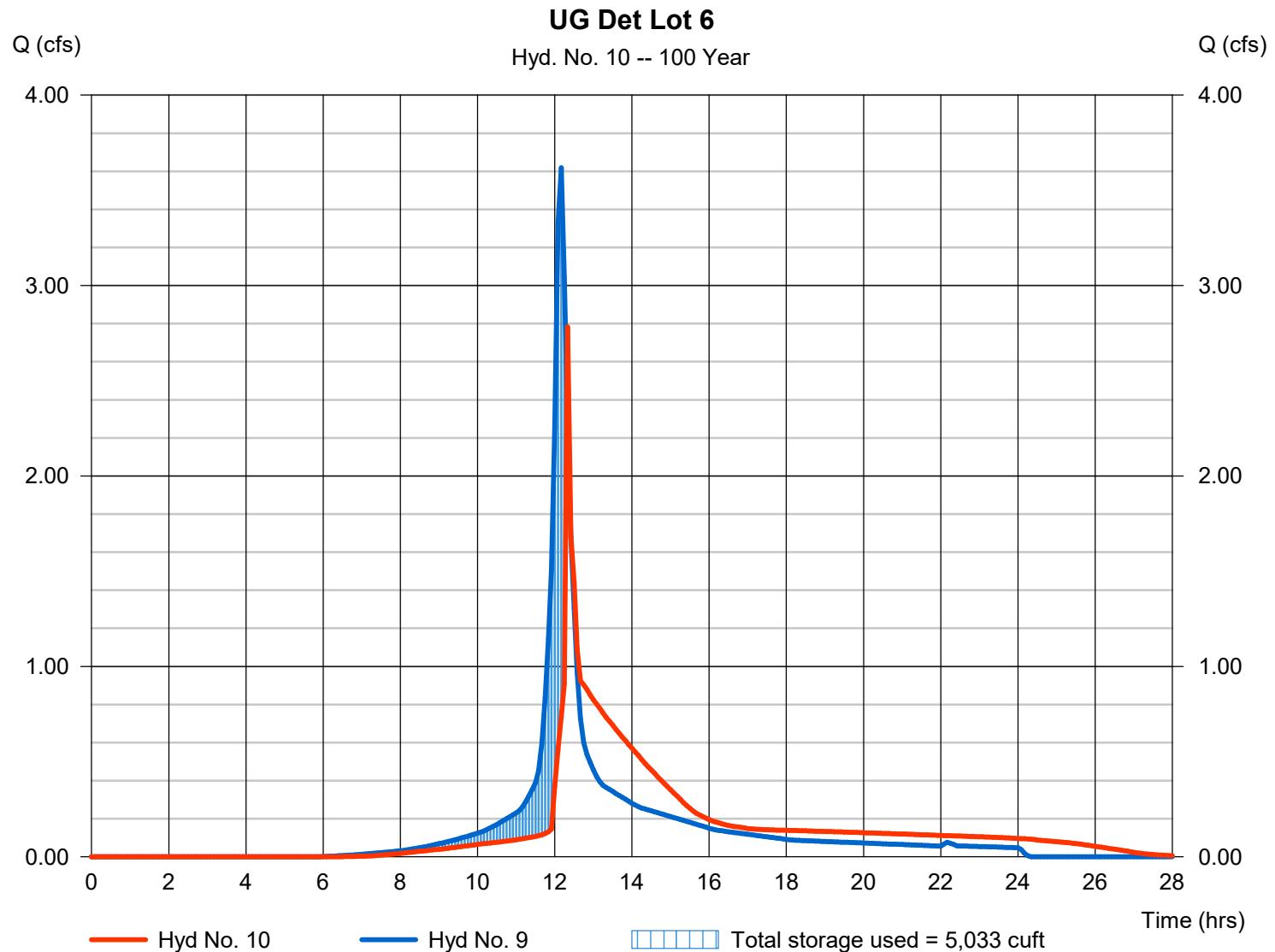
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 2.783 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 5 min	Hyd. volume	= 14,604 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 309.17 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 5,033 cuft

Storage Indication method used.



Hydrograph Report

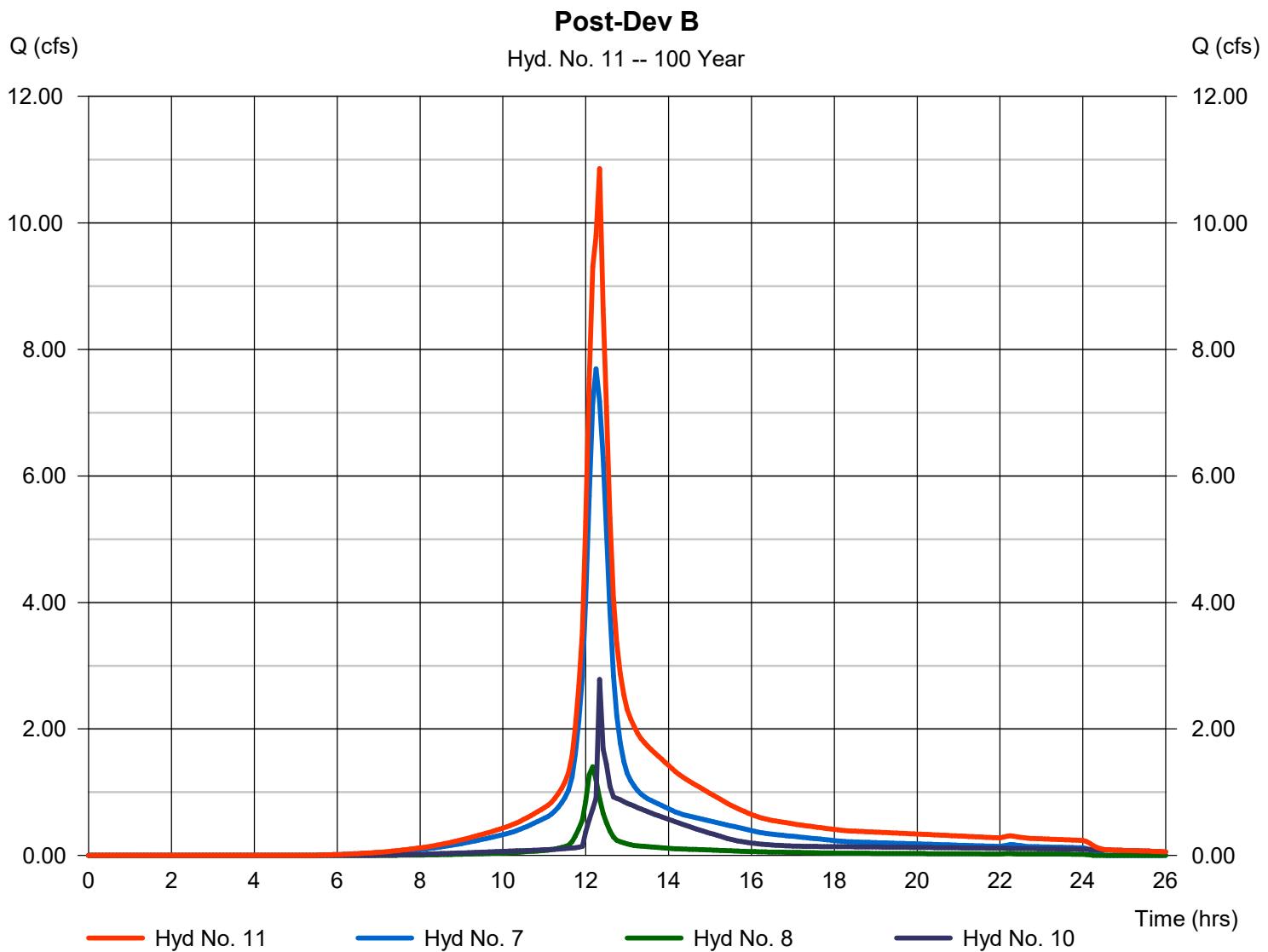
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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Hyd. No. 11

Post-Dev B

Hydrograph type	= Combine	Peak discharge	= 10.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.33 hrs
Time interval	= 5 min	Hyd. volume	= 57,716 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 2.082 ac

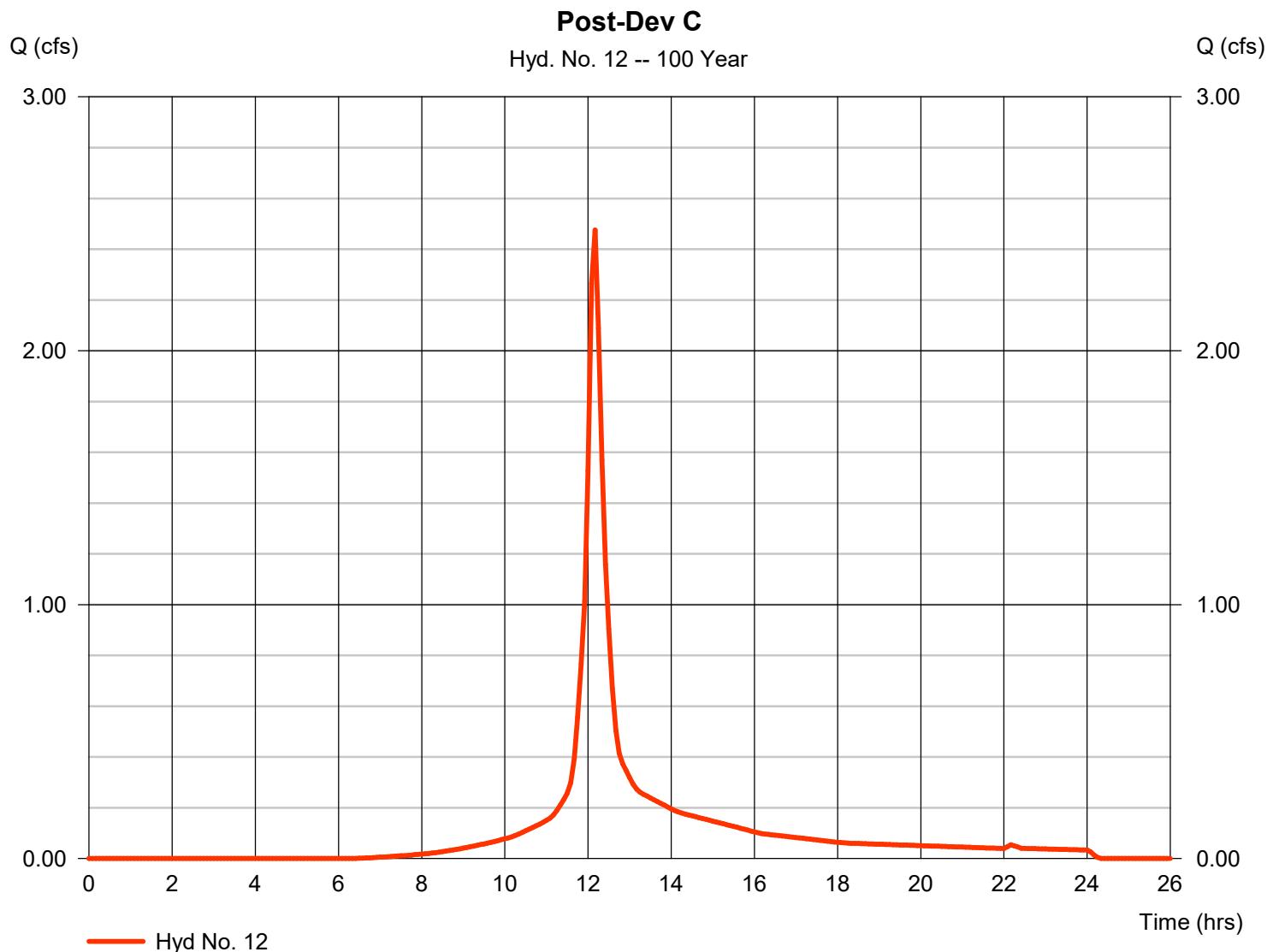


Hydrograph Report

Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.476 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 9,940 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

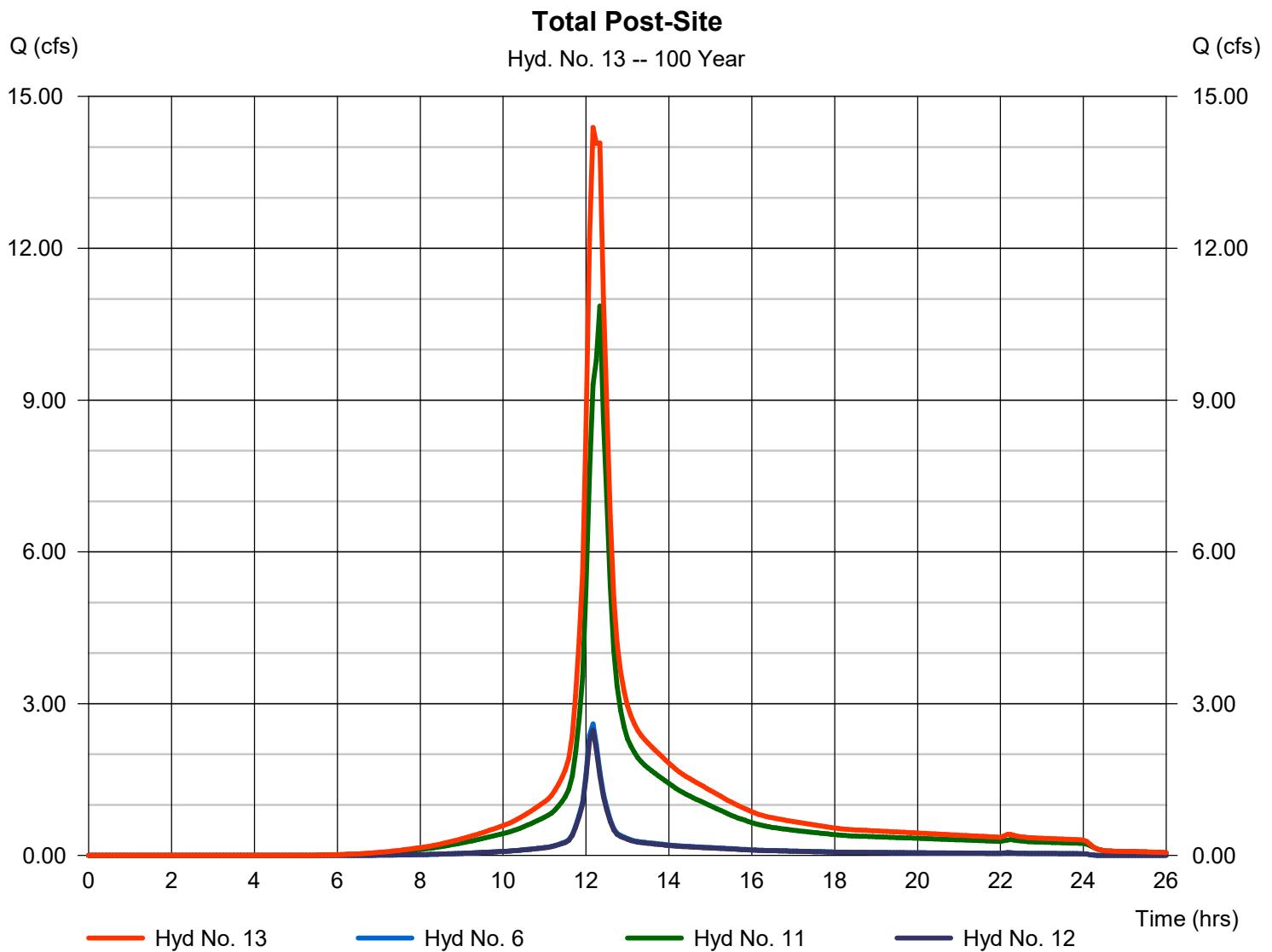
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 14.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 78,083 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac



Hydraflow Table of Contents

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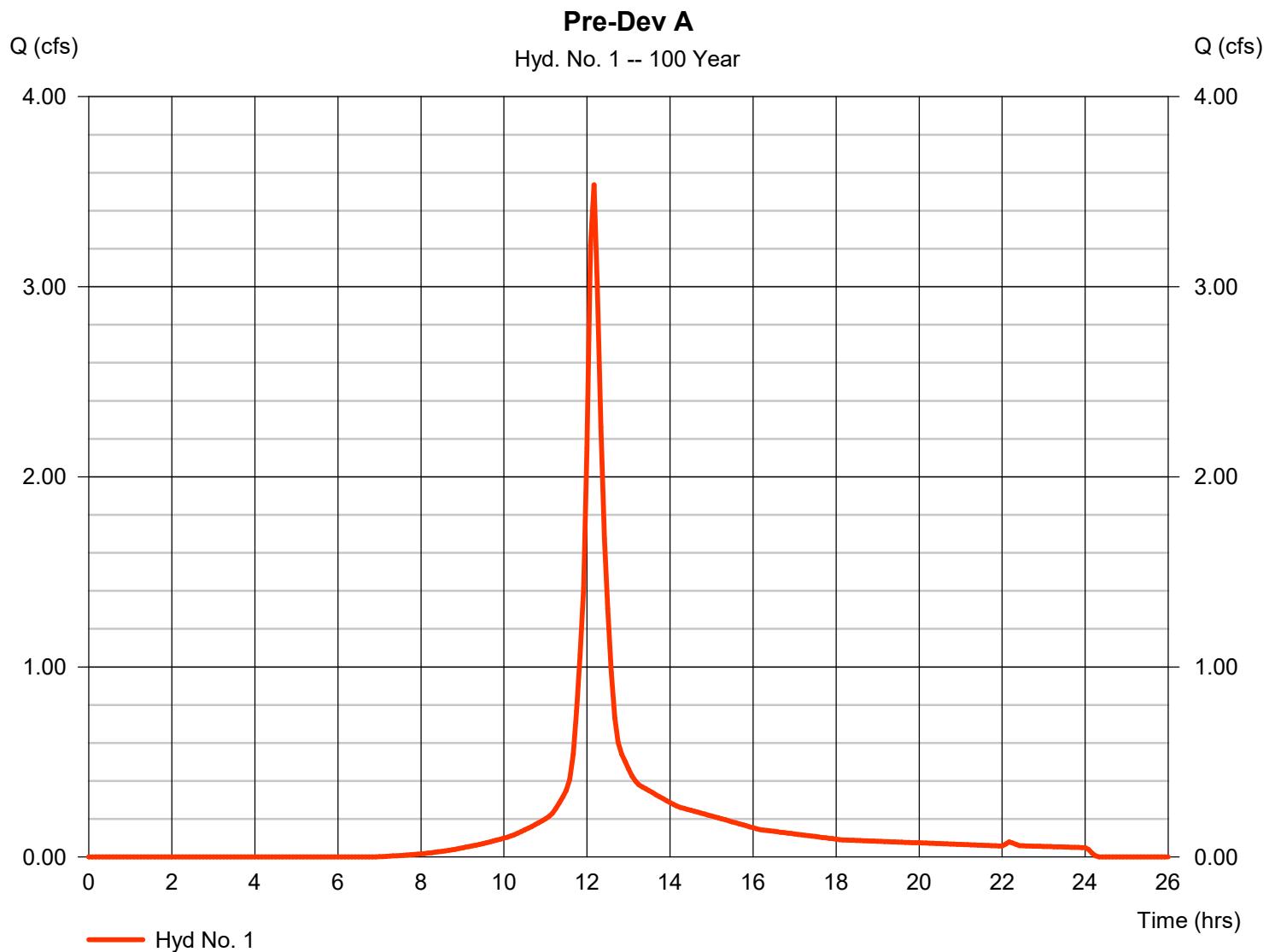
This analysis demonstrates that the weir wall in OCS-1 and the 12" HDPE outlet pipe will pass the 100 year storm in the event that both orifices get clogged.

Hydrograph Report

Hyd. No. 1

Pre-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.537 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 14,126 cuft
Drainage area	= 0.816 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.40 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

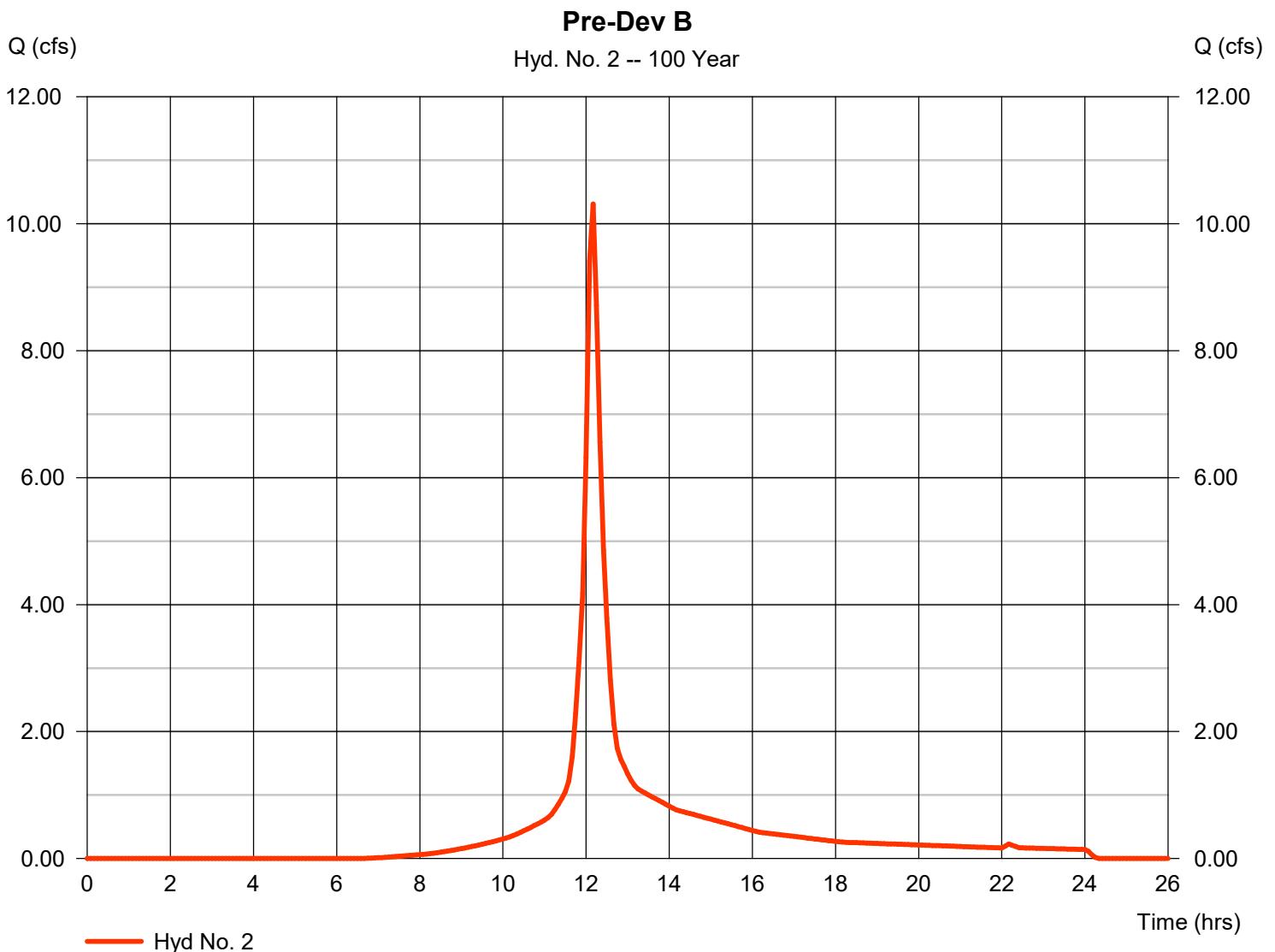


Hydrograph Report

Hyd. No. 2

Pre-Dev B

Hydrograph type	= SCS Runoff	Peak discharge	= 10.31 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 41,297 cuft
Drainage area	= 2.316 ac	Curve number	= 75.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.30 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

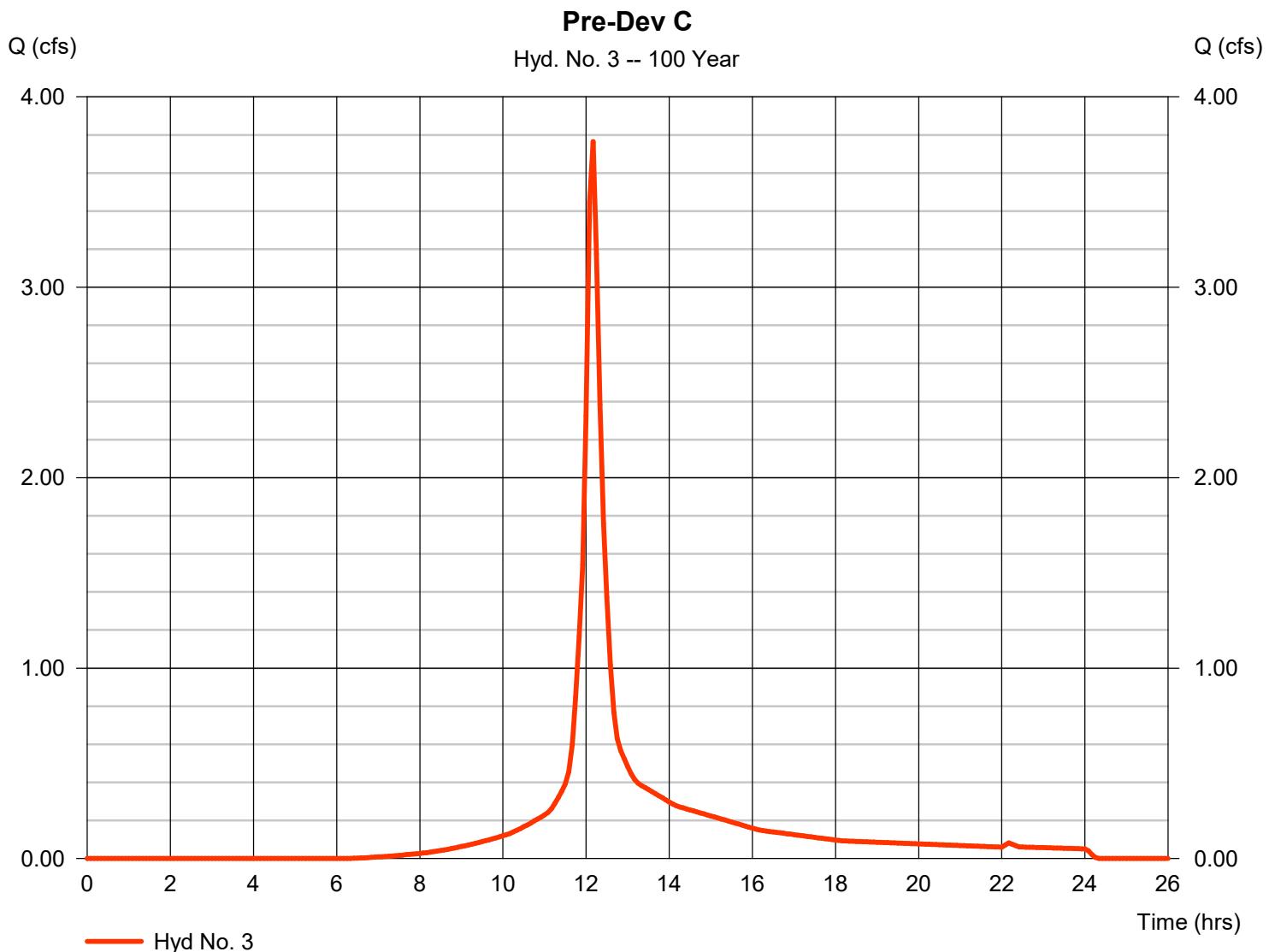


Hydrograph Report

Hyd. No. 3

Pre-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 3.765 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 15,122 cuft
Drainage area	= 0.824 ac	Curve number	= 76.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

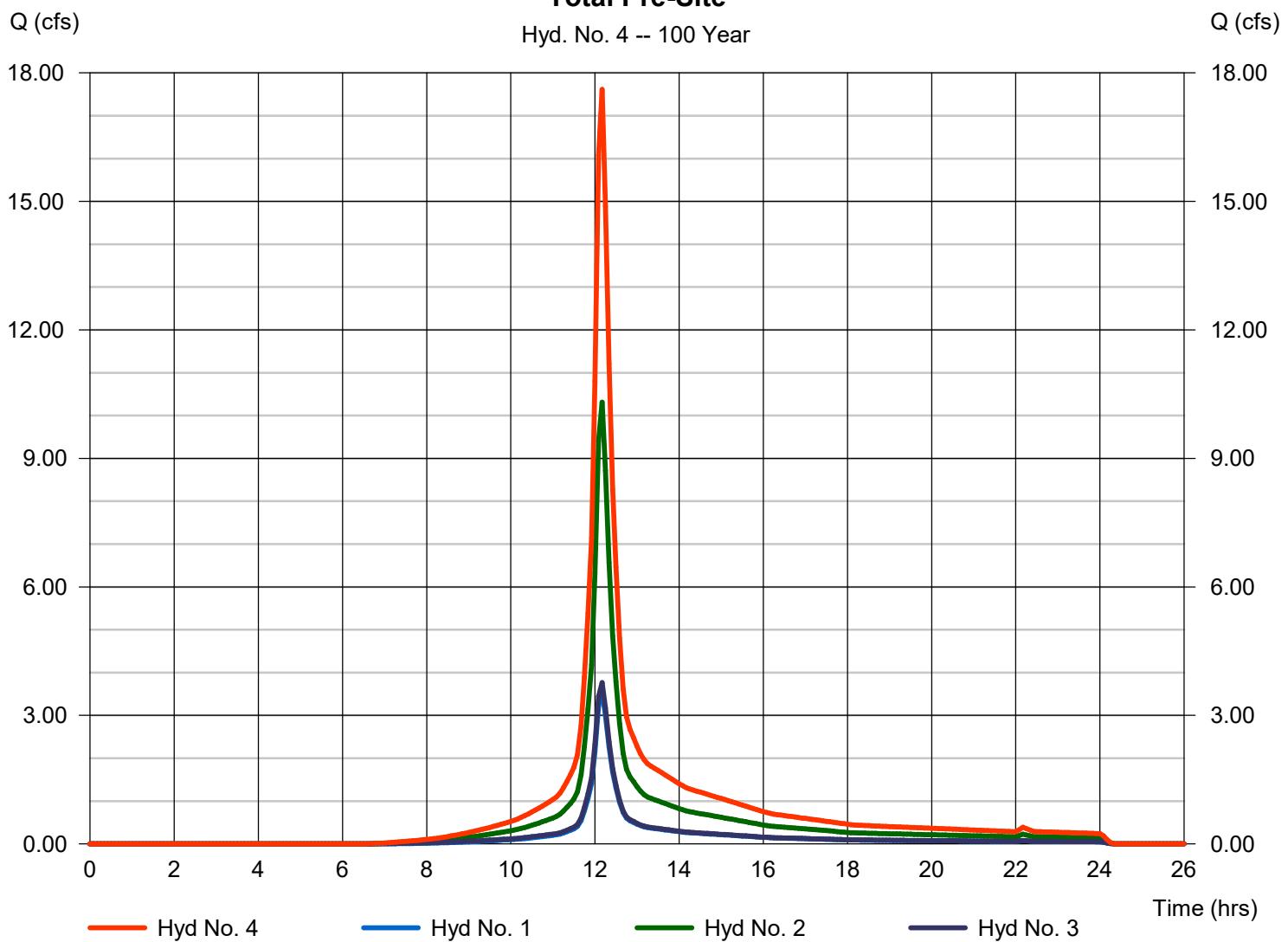
Hyd. No. 4

Total Pre-Site

Hydrograph type	= Combine	Peak discharge	= 17.61 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 70,545 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.956 ac

Total Pre-Site

Hyd. No. 4 -- 100 Year

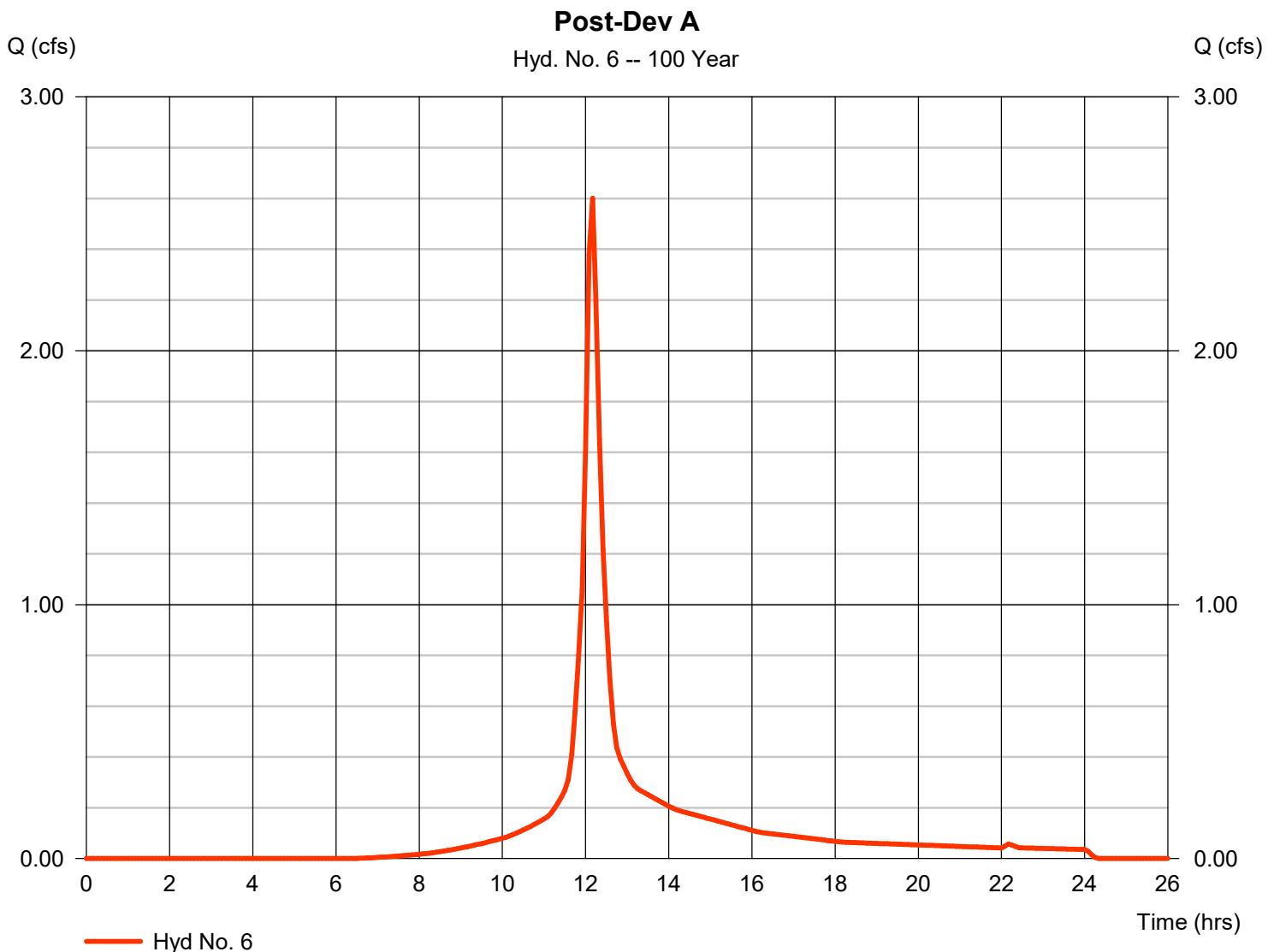


Hydrograph Report

Hyd. No. 6

Post-Dev A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.600 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 10,427 cuft
Drainage area	= 0.577 ac	Curve number	= 75.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

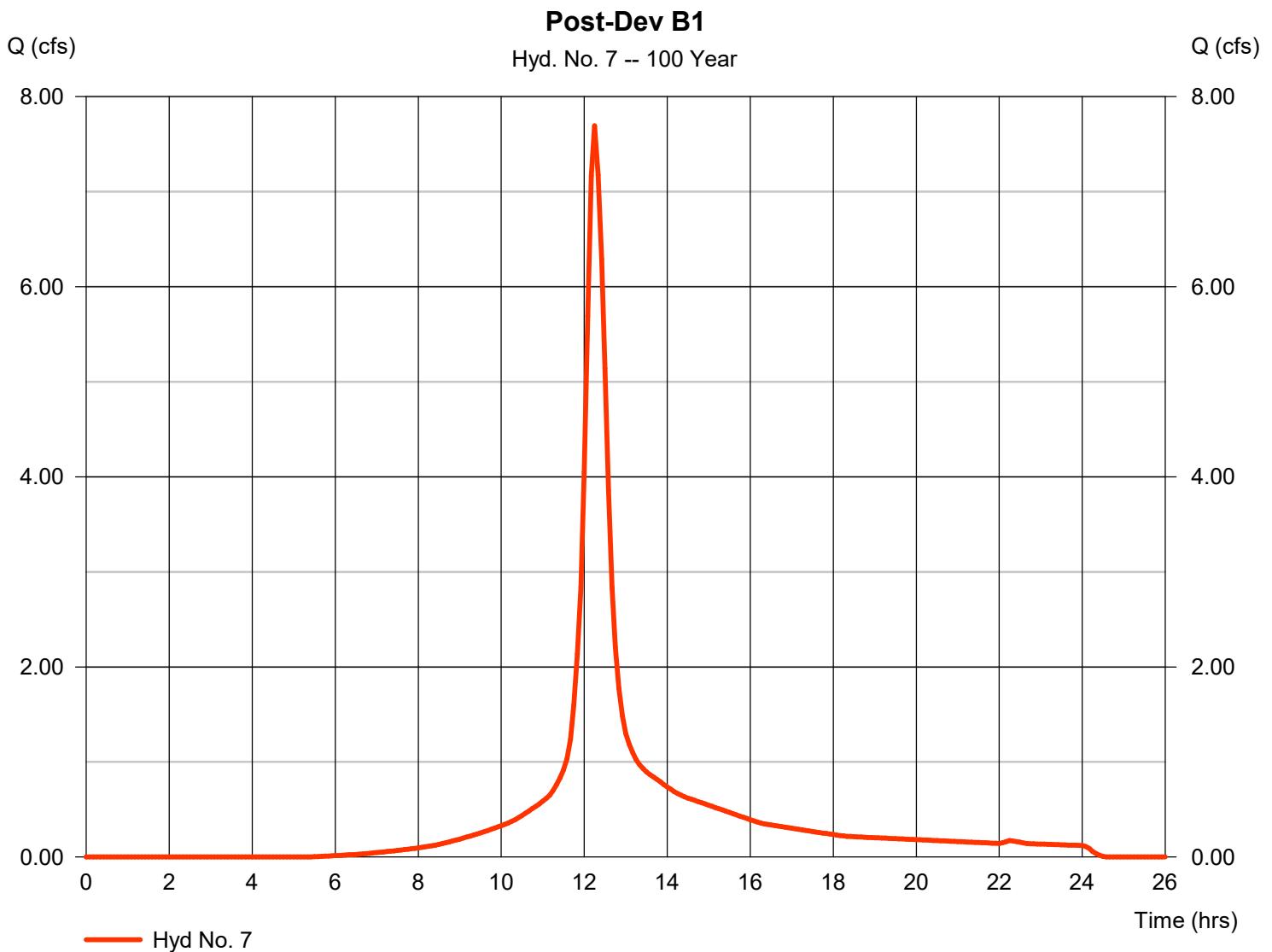


Hydrograph Report

Hyd. No. 7

Post-Dev B1

Hydrograph type	= SCS Runoff	Peak discharge	= 7.695 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 37,503 cuft
Drainage area	= 1.758 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.20 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

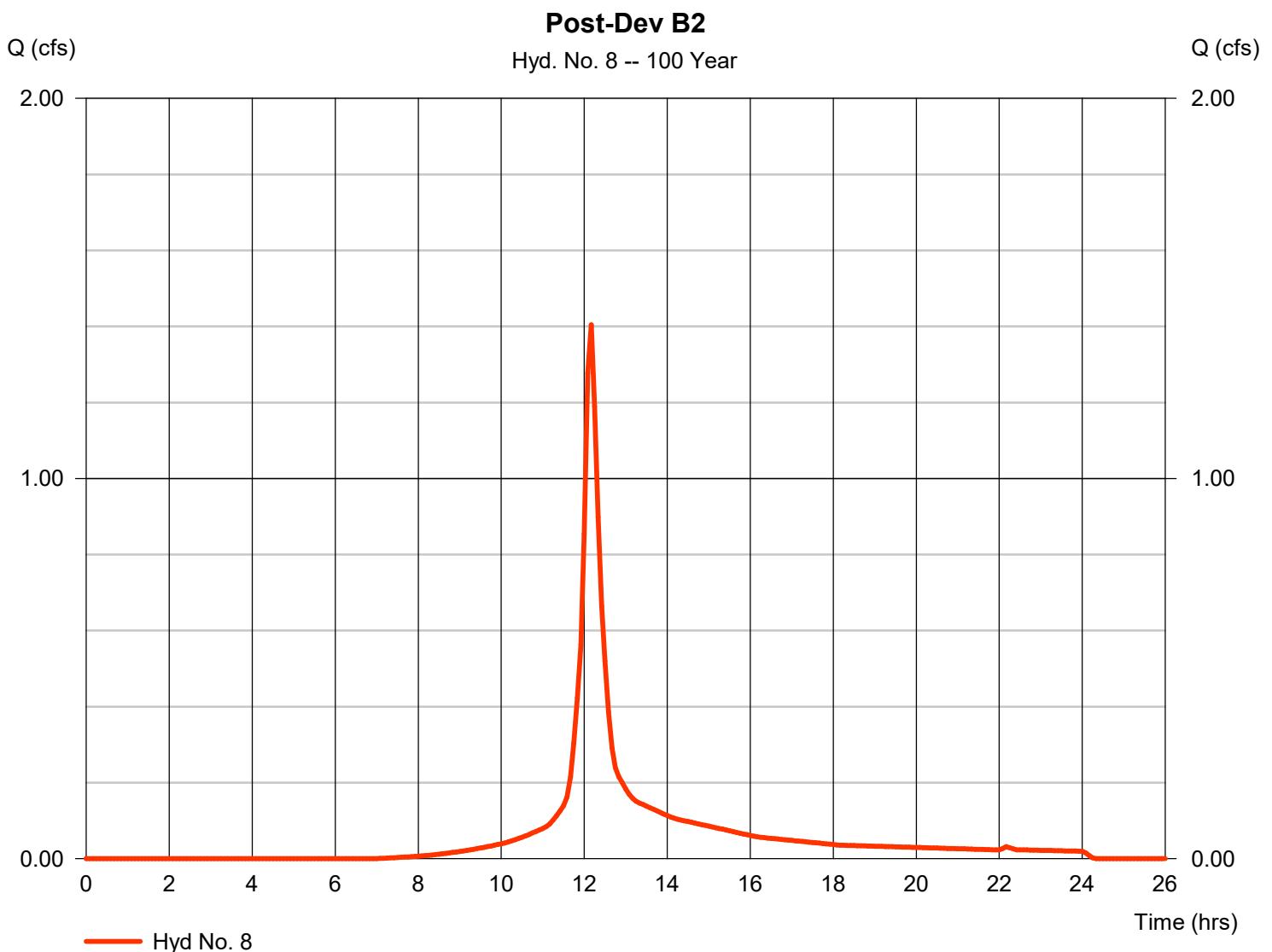
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

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Hyd. No. 8

Post-Dev B2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.404 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 5,609 cuft
Drainage area	= 0.324 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

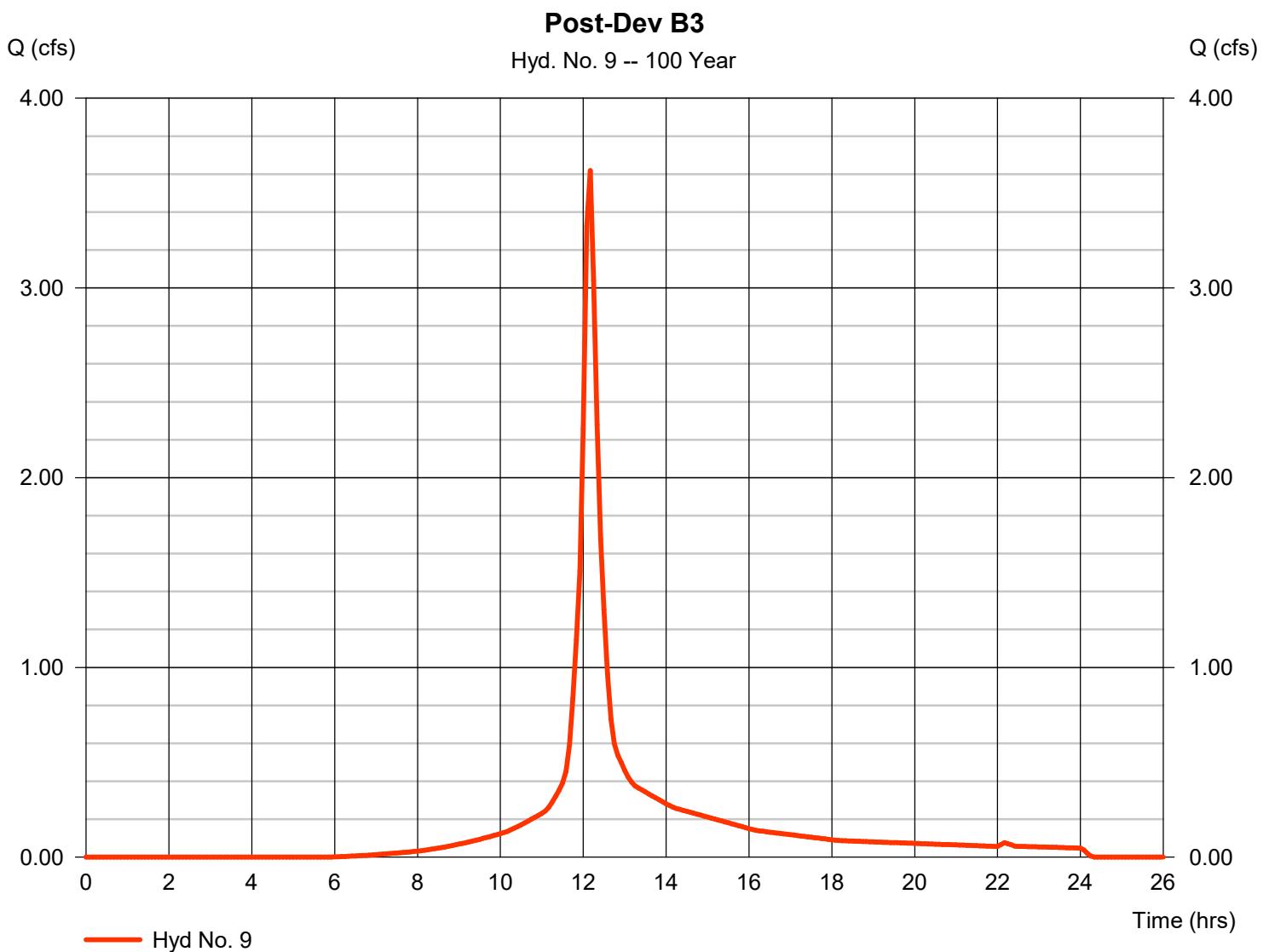


Hydrograph Report

Hyd. No. 9

Post-Dev B3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.619 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 14,611 cuft
Drainage area	= 0.766 ac	Curve number	= 78.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.70 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

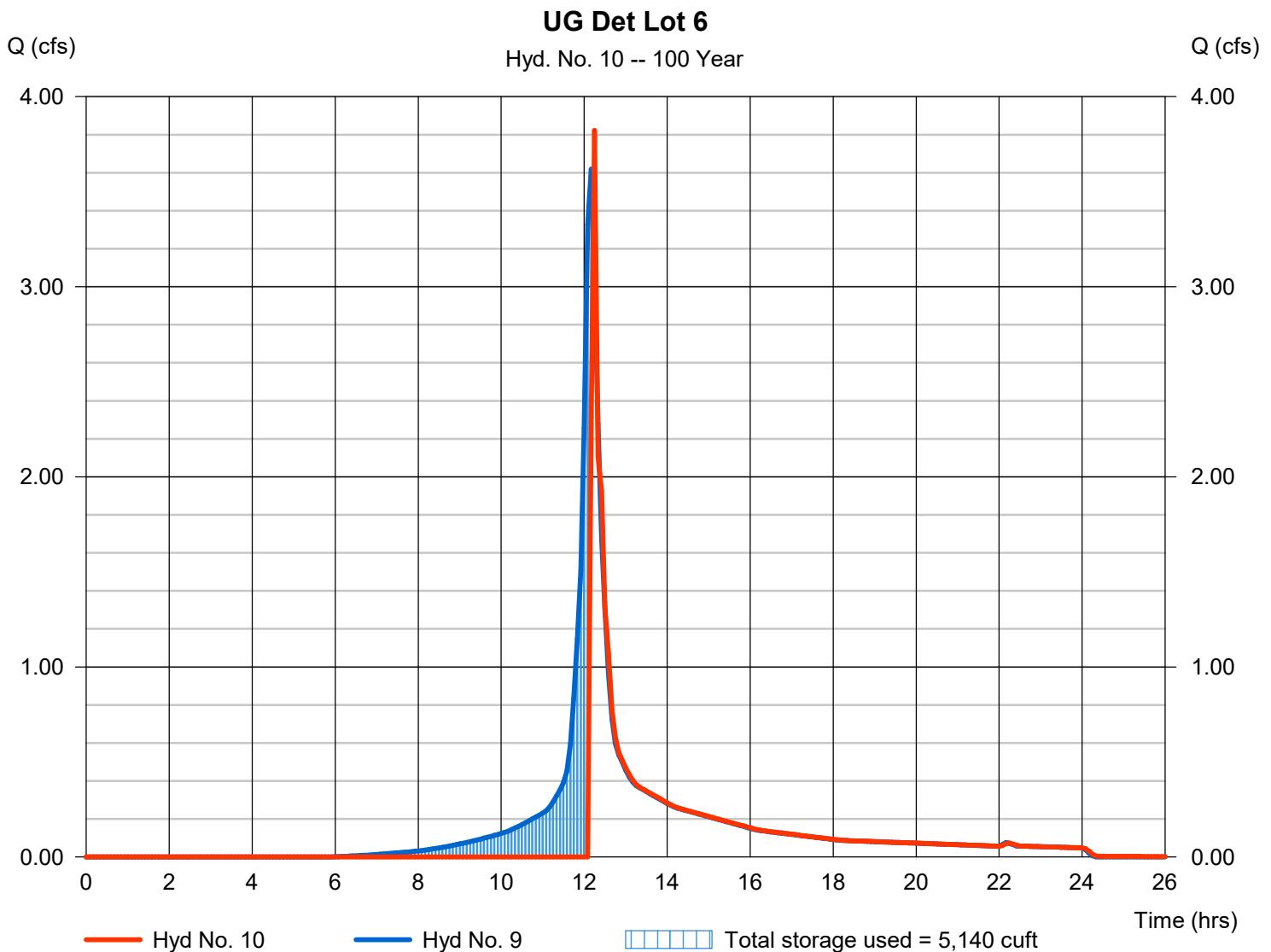
Monday, 07 / 1 / 2019

Hyd. No. 10

UG Det Lot 6

Hydrograph type	= Reservoir	Peak discharge	= 3.823 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 9,768 cuft
Inflow hyd. No.	= 9 - Post-Dev B3	Max. Elevation	= 309.25 ft
Reservoir name	= UG Det Lot6	Max. Storage	= 5,140 cuft

Storage Indication method used.



Pond Report

10

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Pond No. 2 - UG Det Lot6

Pond Data

UG Chambers -Invert elev. = 304.50 ft, Rise x Span = 3.75 x 6.40 ft, Barrel Len = 173.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 303.75 ft, Width = 8.40 ft, Height = 5.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	303.75	n/a	0	0
0.55	304.30	n/a	320	320
1.10	304.85	n/a	552	872
1.65	305.40	n/a	680	1,552
2.20	305.95	n/a	666	2,218
2.75	306.50	n/a	644	2,862
3.30	307.05	n/a	610	3,471
3.85	307.60	n/a	559	4,030
4.40	308.15	n/a	475	4,505
4.95	308.70	n/a	330	4,835
5.50	309.25	n/a	320	5,155

Culvert / Orifice Structures

Weir Structures

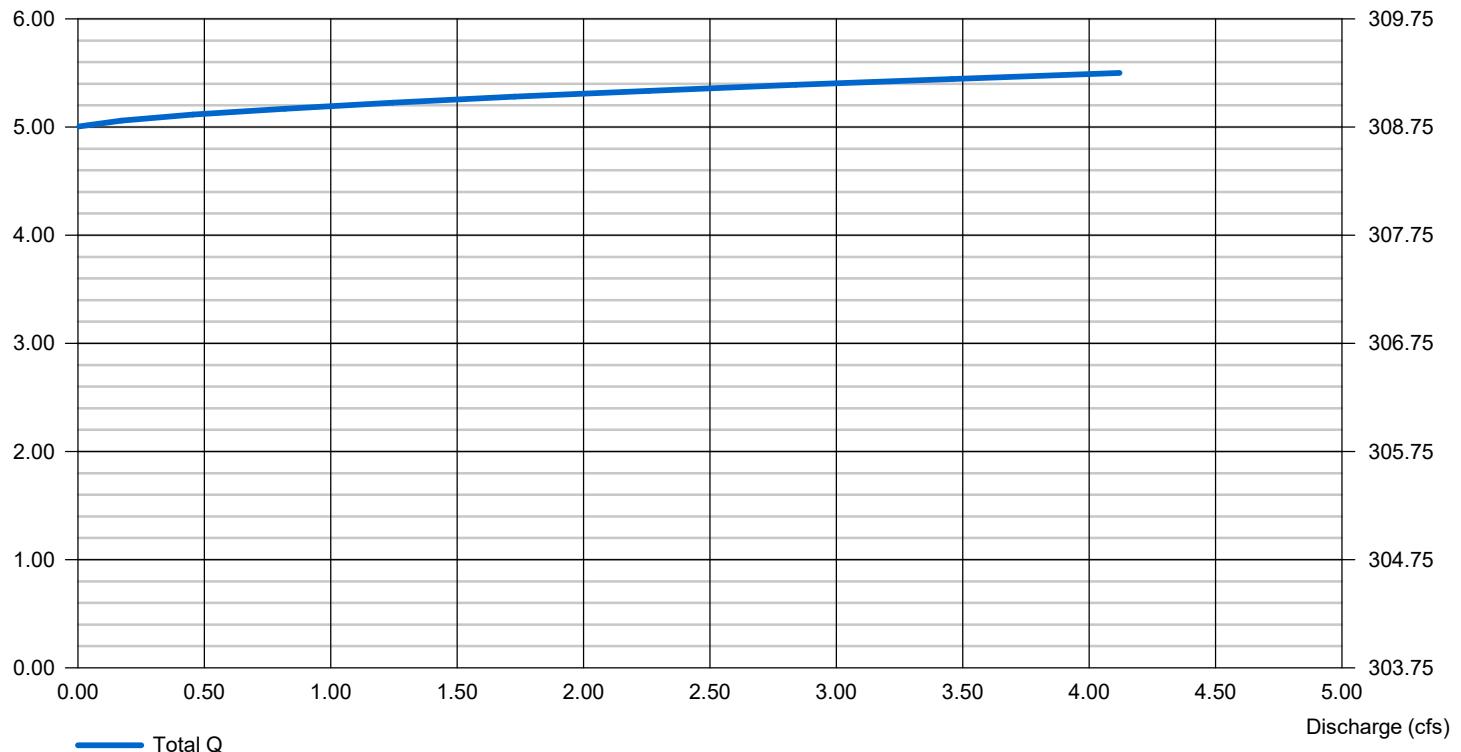
	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 12.00	Inactive	Inactive	0.00	Crest Len (ft)	= 3.50	0.00	0.00	0.00
Span (in)	= 12.00	2.00	4.00	0.00	Crest El. (ft)	= 308.75	0.00	0.00	0.00
No. Barrels	= 1	1	1	0	Weir Coeff.	= 3.33	3.33	3.33	3.33
Invert El. (ft)	= 303.75	303.75	305.75	0.00	Weir Type	= Rect	---	---	---
Length (ft)	= 8.00	0.00	0.00	0.00	Multi-Stage	= Yes	No	No	No
Slope (%)	= 1.00	0.00	0.00	n/a	Exfil.(in/hr)	= 0.000 (by Contour)			
N-Value	= .013	.013	.013	n/a	TW Elev. (ft)	= 0.00			
Orifice Coeff.	= 0.60	0.60	0.60	0.60					
Multi-Stage	= n/a	Yes	Yes	No					

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage (ft)

Stage / Discharge

Elev (ft)



Hydrograph Report

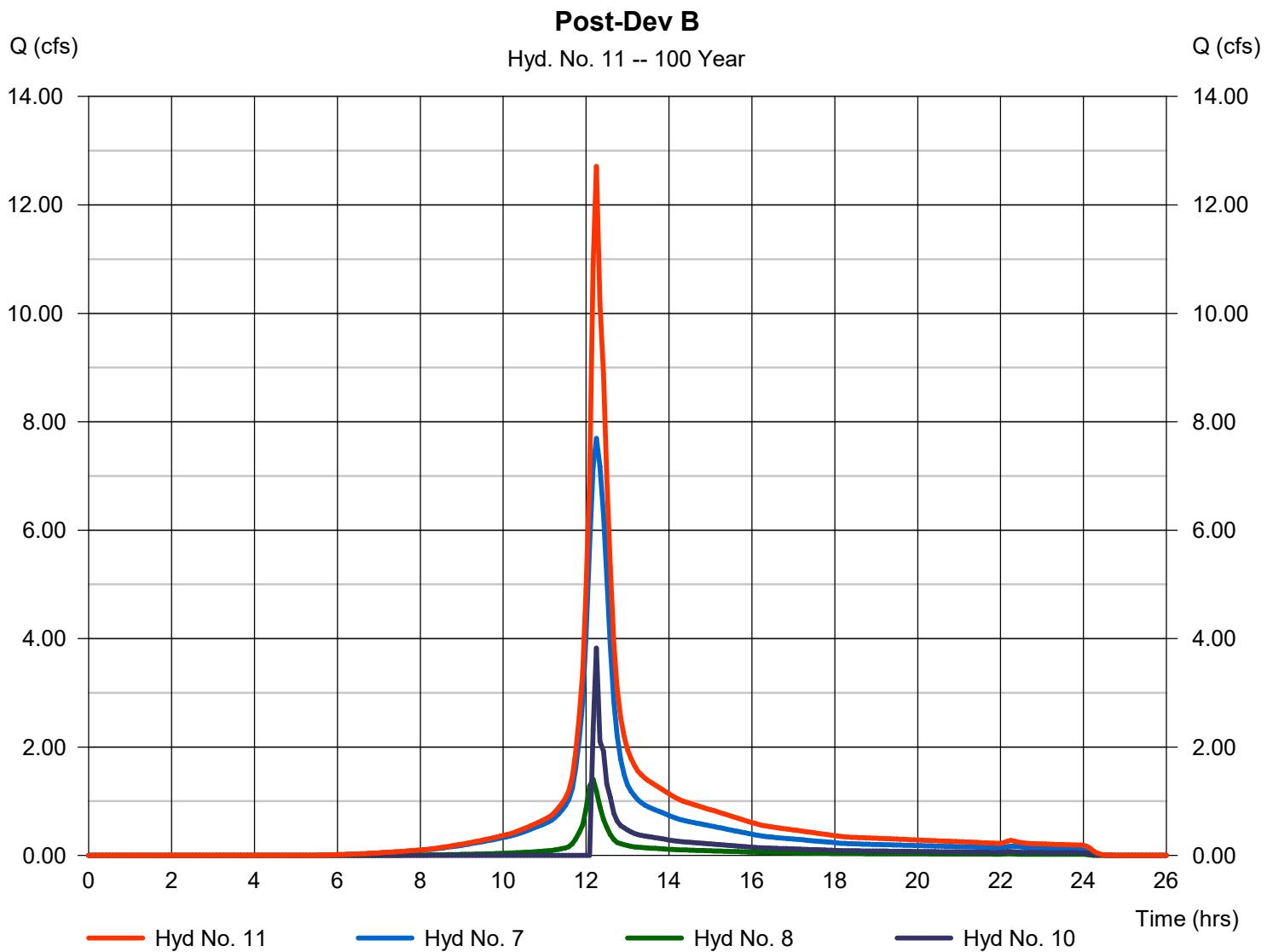
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 11

Post-Dev B

Hydrograph type	= Combine	Peak discharge	= 12.71 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 52,880 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 2.082 ac

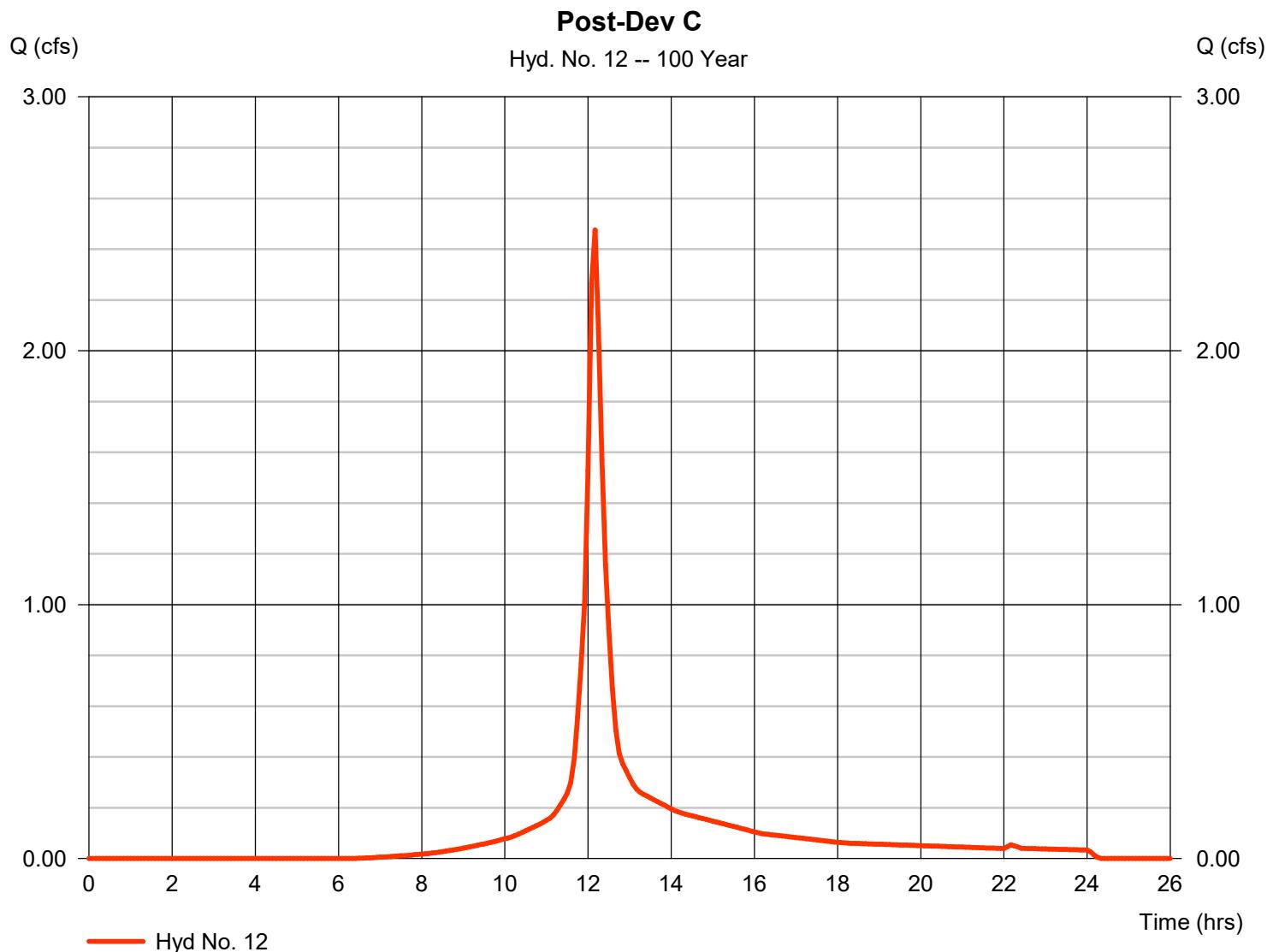


Hydrograph Report

Hyd. No. 12

Post-Dev C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.476 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 5 min	Hyd. volume	= 9,940 cuft
Drainage area	= 0.544 ac	Curve number	= 76.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.18 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

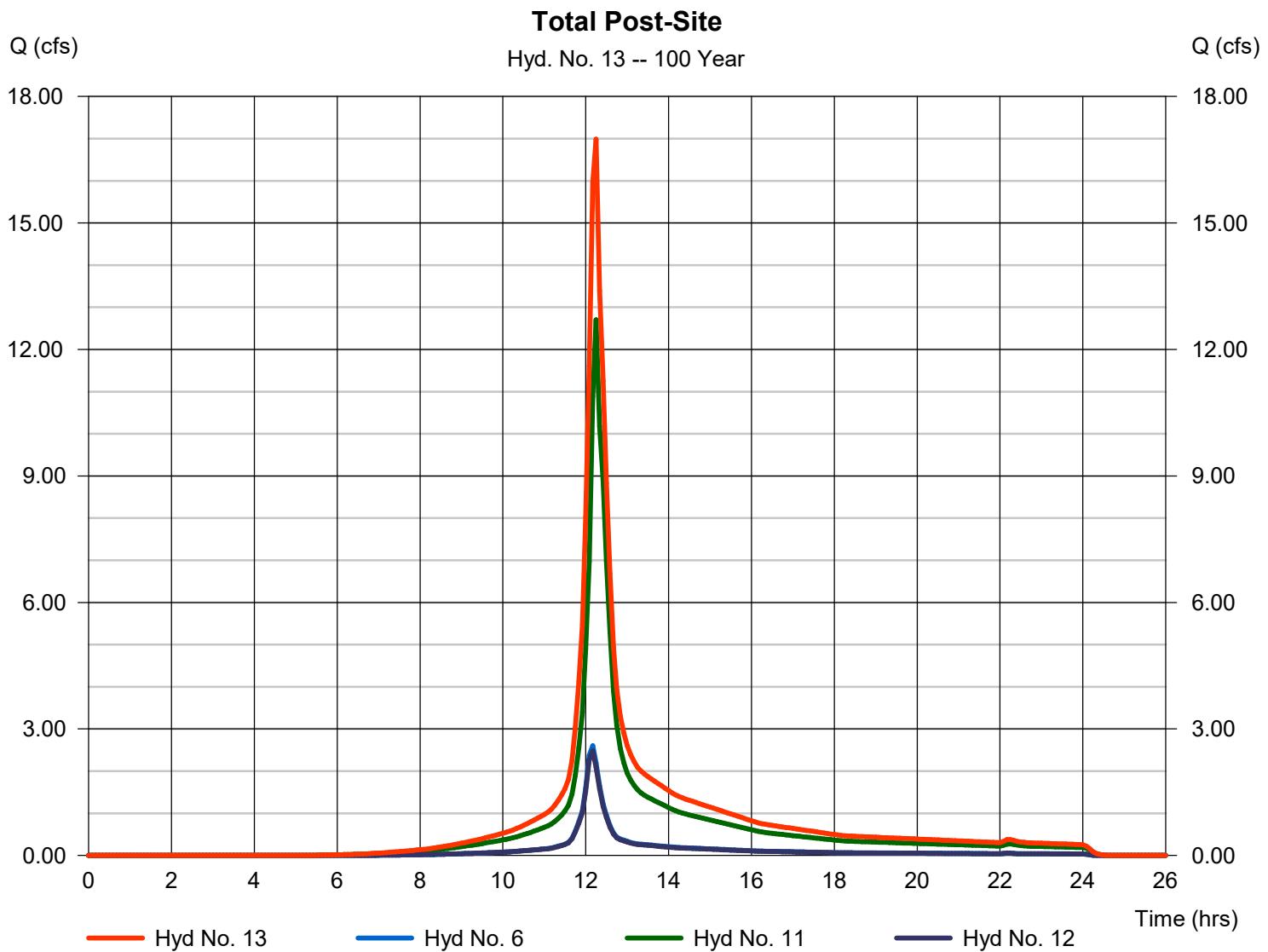
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2019

Monday, 07 / 1 / 2019

Hyd. No. 13

Total Post-Site

Hydrograph type	= Combine	Peak discharge	= 16.99 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 5 min	Hyd. volume	= 73,247 cuft
Inflow hyds.	= 6, 11, 12	Contrib. drain. area	= 1.121 ac



APPENDIX C

Storm Sewer System Design

SUBJECT 380 Tunxis Rd, West Hartford
Storm Sewer
JOB NO. 2180652

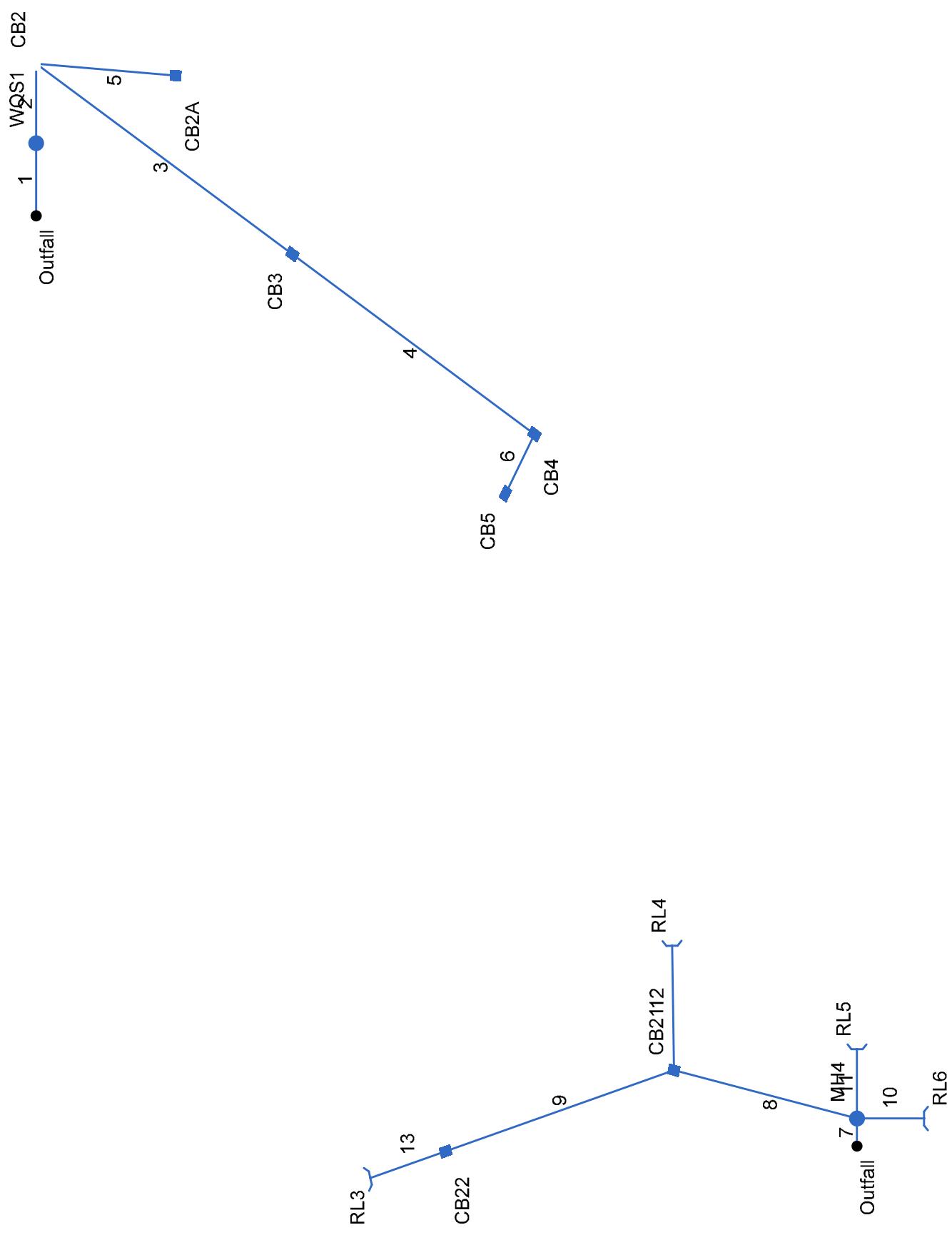


SHEET NO. 1 OF 1
COMPUTED BY BH DATE 4/16/2019
CHECKED BY JSP DATE 4/16/2019

DATA SHEET FOR RATIONAL METHOD STORM DRAINAGE DESIGN											
NODE		AREA	RUNOFF COEFFICIENT C			TIME OF CONCENTRATION (TR-55)					
AREA I.D.	AREA (S.F.)	ACRES	DESCRIPTION	C VALUE	TOTAL AC	ELEV. DIFF. FT	LENGTH FT	SLOPE %	COVER	TIME MIN.	Flow Type
Roadway Storm Drainage System											
WQS-1	2519	0.058	PAVEMENT	0.9	0.052	(Minimum Tc for pavement)			5		
(Type C Top)	0	0.000	GRASS	0.3	0.000						
TOTAL	2519	0.058		0.9	0.052						
CB-2	5756	0.132	PAVEMENT	0.9	0.119	(Minimum Tc for grass)			10		
(Type C)	3039	0.070	GRASS	0.3	0.021						
TOTAL	8795	0.202		0.69	0.140						
CB-2A	1084	0.025	ROOF	0.9	0.022	3	100	3	Grass	12.8	Sheet
(Type C-L)	25909	0.595	GRASS	0.3	0.178	23	176	13	Grass	0.51	Shallow
						4	100	4	Grass	0.52	Shallow
TOTAL	26993	0.620		0.32	0.201	(Tc Calculation from Hydraflow)			13.8	(Total)	
CB-3	2126	0.049	PAVEMENT	0.9	0.044	10	100	10	Grass	7.9	Sheet
(Type C)	19047	0.437	GRASS	0.3	0.131	7	82	9	Grass	0.28	Shallow
						16	32	50	Grass	0.05	Shallow
						2.5	140	2	Grass	1.02	Shallow
TOTAL	21173	0.486		0.36	0.175					9.25	(Total)
CB-4	5160	0.118	PAVEMENT	0.9	0.107	(Minimum Tc for grass)			10		
(Type C)	5465	0.125	GRASS	0.3	0.038						
TOTAL	10625	0.244		0.59	0.144						
CB-5	4511	0.104	PAVEMENT	0.9	0.093	(Minimum Tc for pavement)			5		
(Type C)	0	0.000	GRASS	0.3	0.000						
TOTAL	4511	0.104		0.9	0.093						
TOTAL		1.713	(Roadway Storm System)								

Subdivision Storm Drainage System											
CB-20	1536	0.035	GRASS	0.3	0.011	(Minimum Tc for grass)				10	
(Type C-L)											
CB-21	17151	0.394	GRASS	0.3	0.118	5	100	5	Grass	10.4	Sheet
(Type C-L)						12	50	24	Grass	0.11	Shallow
						2.5	72	3	Grass	0.43	Shallow
						(Tc Calculation from Hydraflow)			10.9	(Total)	
CB-22	9912	0.228	GRASS	0.3	0.068	3.5	100	4	Grass	11.4	Sheet
(Type C-L)						16	72	22	Grass	0.16	Shallow
						3	119	3	Grass	0.71	Shallow
										12.2	(Total)
RL6 to	740	0.017	ROOF	0.9	0.015	(Minimum Tc for roof)				5	
CB20											
RL5 to	1023	0.023	ROOF	0.9	0.021	(Minimum Tc for roof)				5	
CB20											
RL4 to	2176	0.050	ROOF	0.9	0.045	(Minimum Tc for roof)				5	
CB21											
RL3 to	2176	0.050	ROOF	0.9	0.045	(Minimum Tc for roof)				5	
CB22											
TOTAL		0.797	(Subdivision Storm System)								

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm Sewer_R3.stm

Number of lines: 13

Date: 7/8/2019

Storm Sewer Inventory Report

Line No.	Alignment			Flow Data				Physical Data				Line ID					
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drg Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert EI Dn (ft)	Line Slope (%)	Line Size (in)	N Value (n)	J-Loss Coeff (K)	Inlet Rim EI (ft)			
1	End	21.000	0.000	Comb	0.00	0.06	0.90	5.0	303.62	1.00	303.83	15	Cir	0.013	1.58	307.83	Outlet to WQS1
2	1	23.000	0.000	Comb	0.00	0.20	0.69	10.0	303.83	1.00	304.06	12	Cir	0.013	1.50	307.83	WQS1 to CB2
3	2	107.000	121.000	Comb	0.00	0.49	0.36	9.2	304.06	1.44	305.60	12	Cir	0.013	0.50	308.99	CB2 to CB3
4	3	101.000	0.000	Comb	0.00	0.24	0.59	10.0	305.60	1.09	306.70	12	Cir	0.013	1.00	310.10	CB3 to CB4
5	2	50.000	94.000	Grate	0.00	0.62	0.32	13.8	304.31	4.38	306.50	12	Cir	0.013	0.00	309.70	CB2 to CB2A
6	4	20.000	90.000	Comb	0.00	0.10	0.90	5.0	306.70	1.00	306.90	12	Cir	0.013	0.00	310.10	CB4 to CB5
7	End	8.000	0.000	MH	0.00	0.00	0.00	0.0	304.50	0.00	304.50	24	Cir	0.013	0.67	310.10	UG Det to CB20
8	7	67.000	-78.000	Grate	0.00	0.39	0.30	10.9	306.30	1.04	307.00	8	Cir	0.013	0.00	311.70	CB20 to CB21
9	8	85.000	-28.000	Grate	0.00	0.23	0.30	12.2	307.00	1.18	308.00	8	Cir	0.013	0.00	311.00	CB21 to CB22
10	7	24.000	90.000	HdwI	0.00	0.02	0.90	5.0	306.30	1.00	306.54	6	Cir	0.013	0.00	314.00	RL6 to CB20
11	7	20.000	0.000	HdwI	0.00	0.02	0.90	5.0	306.30	1.00	306.50	6	Cir	0.013	0.00	313.50	RL5 to CB20
12	8	36.000	77.000	HdwI	0.00	0.05	0.90	5.0	307.00	1.00	307.36	6	Cir	0.013	0.00	313.00	RL4 to CB21
13	9	28.000	0.000	HdwI	0.00	0.05	0.90	5.0	308.00	1.00	308.28	6	Cir	0.013	0.00	312.00	RL3 to CB22
													Number of lines: 13	Date: 7/8/2019			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	Dns Line No.	Junction Type
1	Outlet to WQS1	3.47	15	Cir	21.000	303.62	303.83	1.000	304.42	304.58	n/a	304.58 j	End
2	WQS1 to CB2	3.24	12	Cir	23.000	303.83	304.06	1.000	304.58	304.83	0.58	304.83	1 Combination
3	CB2 to CB3	2.07	12	Cir	107.000	304.06	305.60	1.439	304.83	306.21	n/a	306.21 j	2 Combination
4	CB3 to CB4	1.24	12	Cir	101.000	305.60	306.70	1.089	306.21	307.17	n/a	307.17 j	3 Combination
5	CB2 to CB2A	0.89	12	Cir	50.000	304.31	306.50	4.380	304.83	306.90	n/a	306.90 j	2 Grate
6	CB4 to CB5	0.67	12	Cir	20.000	306.70	306.90	1.000	307.17	307.24	n/a	307.24 j	4 Combination
7	UG Det to CB20	1.42	24	Cir	8.000	304.50	304.50	0.000	306.58*	306.58*	0.00	306.58	End
8	CB20 to CB21	1.28	8	Cir	67.000	306.30	307.00	1.045	306.97	307.65	0.00	307.65	7 Grate
9	CB21 to CB22	0.55	8	Cir	85.000	307.00	308.00	1.176	307.65	308.35	n/a	308.35 j	8 Grate
10	RL6 to CB20	0.13	6	Cir	24.000	306.30	306.54	1.000	306.58	306.72	n/a	306.72 j	7 OpenHeadwall
11	RL5 to CB20	0.13	6	Cir	20.000	306.30	306.50	1.000	306.58	306.68	n/a	306.68 j	7 OpenHeadwall
12	RL4 to CB21	0.33	6	Cir	36.000	307.00	307.36	1.000	307.65	307.76	0.00	307.76	8 OpenHeadwall
13	RL3 to CB22	0.33	6	Cir	28.000	308.00	308.28	1.000	308.35	308.57	n/a	308.57 j	9 OpenHeadwall
													Number of lines: 13
													Run Date: 7/8/2019

Project File: Storm Sewer_R3.stm

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Page 1

Line	To Line	Len (ft)	Drgn Area (ac)	Rnoff coeff (C)	Incr	Total	Inlet	Tc (min)	Tc	Rain (I) (in/hr)	Total flow (cfs)	Vel Cap full	Pipe	Invert Elev	HGL Elev	Grnd / Rim Elev	Line ID					
Station													Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)				
1	End	21.000	0.06	1.71	0.90	0.05	0.80	5.0	14.6	4.3	3.47	6.46	4.34	15	1.00	303.62	303.83	304.42	304.58	305.12	307.83	Outlet to WQS1
2	1	23.000	0.20	1.65	0.69	0.14	0.74	10.0	14.5	4.4	3.24	3.56	5.06	12	1.00	303.83	304.06	304.58	304.83	307.83	307.83	WQS1 to CB2
3	2	107.000	0.49	0.83	0.36	0.18	0.41	9.2	11.1	5.1	2.07	4.27	3.64	12	1.44	304.06	305.60	304.83	306.21	307.83	308.99	CB2 to CB3
4	3	101.000	0.24	0.34	0.59	0.14	0.23	10.0	10.0	5.4	1.24	3.72	2.94	12	1.09	305.60	306.70	306.21	307.17	308.99	310.10	CB3 to CB4
5	2	50.000	0.62	0.62	0.32	0.20	0.20	13.8	13.8	4.5	0.89	7.45	2.62	12	4.38	304.31	306.50	304.83	306.90	307.83	309.70	CB2 to CB2A
6	4	20.000	0.10	0.10	0.90	0.09	0.09	5.0	5.0	7.4	0.67	3.56	2.34	12	1.00	306.70	306.90	307.17	307.24	310.10	310.10	CB4 to CB5
7	End	8.000	0.00	0.76	0.00	0.00	0.31	0.0	13.4	4.6	1.42	0.00	0.45	24	0.00	304.50	304.50	306.58	306.58	310.10	310.10	UG Det to CB20
8	7	67.000	0.39	0.72	0.30	0.12	0.28	10.9	13.1	4.6	1.28	1.23	3.67	8	1.04	306.30	307.00	306.97	307.65	310.10	311.70	CB20 to CB21
9	8	85.000	0.23	0.28	0.30	0.07	0.11	12.2	12.2	4.8	0.55	1.31	2.28	8	1.18	307.00	308.00	307.65	308.35	311.70	311.00	CB21 to CB22
10	7	24.000	0.02	0.02	0.90	0.02	0.02	5.0	5.0	7.4	0.13	0.56	1.62	6	1.00	306.30	306.54	306.58	306.72	310.10	314.00	RL6 to CB20
11	7	20.000	0.02	0.02	0.90	0.02	0.02	5.0	5.0	7.4	0.13	0.56	1.62	6	1.00	306.30	306.50	306.58	306.68	310.10	313.50	RL5 to CB20
12	8	36.000	0.05	0.90	0.05	0.05	0.05	5.0	5.0	7.4	0.33	0.56	1.84	6	1.00	307.00	307.36	307.65	307.76	311.70	313.00	RL4 to CB21
13	9	28.000	0.05	0.90	0.05	0.05	0.05	5.0	5.0	7.4	0.33	0.56	2.55	6	1.00	308.00	308.28	308.35	308.57	311.00	312.00	RL3 to CB22
															Number of lines: 13				Run Date: 7/8/2019			

Project File: Storm Sewer_R3.stm

NOTES: Intensity = 35.29 / (Inlet time + 3.70) ^ 0.72; Return period = Yrs. 10 ; c = cir e = ellip b = box

Inlet Report

Page 1

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet		Gutter				Inlet Depth (ft)	Spread (ft)	Depth (in)	Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	S _o (ft/ft)	W (ft)	S _w (ft/ft)	S _x (ft/ft)	n	Depth (ft)				
1	WQS1	0.40	0.17	0.44	0.14	Comb	3.0	3.00	0.00	3.00	1.60	0.012	10.00	0.030	0.013	0.12	4.06	0.24	2.37	2.0	Off
2	CB2	0.74	0.10	0.78	0.05	Comb	3.0	3.00	0.00	3.00	3.20	0.012	10.00	0.030	0.013	0.14	4.68	0.22	1.67	2.0	Off
3	CB3	0.99	0.04	0.93	0.10	Comb	3.0	3.00	0.00	3.00	3.20	0.012	10.00	0.030	0.013	0.15	5.06	0.23	2.09	2.0	2
4	CB4	0.76	0.00	0.72	0.04	Comb	3.0	3.00	0.00	3.00	3.20	0.012	10.00	0.030	0.013	0.14	4.51	0.21	1.53	2.0	3
5	CB2A	0.89	0.00	0.89	0.00	Grate	0.0	0.00	1.64	3.00	1.60	Sag	10.00	0.070	0.000	0.19	2.68	0.35	2.68	2.0	Off
6	CB5	0.67	0.00	0.49	0.17	Comb	3.0	3.00	0.00	3.00	1.60	0.012	10.00	0.030	0.013	0.13	4.30	0.24	2.60	2.0	1
7	MH4	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
8	CB21	0.60	0.00	0.60	0.00	Grate	0.0	0.00	1.64	3.00	1.60	Sag	10.00	0.050	0.000	0.14	2.82	0.31	2.82	2.0	Off
9	CB22	0.33	0.00	0.33	0.00	Grate	0.0	0.00	1.64	3.00	1.60	Sag	10.00	0.050	0.000	0.11	2.16	0.27	2.16	2.0	Off
10	RL6	0.13	0.00	0.13	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.00	0.00	0.00	0.0	Off	
11	RL5	0.13	0.00	0.13	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.00	0.00	0.00	0.0	Off	
12	RL4	0.33	0.00	0.33	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.00	0.00	0.00	0.0	Off	
13	RL3	0.33	0.00	0.33	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.00	0.00	0.00	0.0	Off	

Project File: Storm Sewer_R3.stm

NOTES: Inlet N-Values = 0.016; Intensity = 35.29 / (Inlet time + 3.70) ^ 0.72; Return period = 10 Yrs. ; * Indicates Known Q added.All curb inlets are Horiz throat.

Number of lines: 13

Run Date: 7/8/2019

Hydraulic Grade Line Computations

Page 1

Line	Size (in)	Q (cfs)	Downstream						Upstream						Check	JL coeff	Minor loss (ft)					
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel head (ft/s)	EGL elev (ft)	Sf	Ave Sf (%)	Energy loss (ft)			
1	15	3.47	303.62	304.42	0.80	0.77	4.18	0.32	304.74	0.000	21.000	303.83	304.58 j	0.75**	0.77	4.51	0.32	304.90	0.000	0.000	n/a	1.58
2	12	3.24	303.83	304.58	0.75	0.63	5.13	0.39	304.97	0.000	23.000	304.06	304.83	0.77**	0.65	4.99	0.39	305.22	0.000	0.000	n/a	1.50
3	12	2.07	304.06	304.83	0.77	0.51	3.19	0.26	305.09	0.000	107.000	305.60	306.21 j	0.61**	0.51	4.09	0.26	306.47	0.000	0.000	n/a	0.50
4	12	1.24	305.60	306.21	0.61	0.36	2.45	0.18	306.40	0.000	101.000	306.70	307.17 j	0.47**	0.36	3.42	0.18	307.35	0.000	0.000	n/a	1.00
5	12	0.89	304.31	304.83	0.52	0.29	2.15	0.15	304.98	0.000	50.000	306.50	306.90 j	0.40**	0.29	3.09	0.15	307.04	0.000	0.000	n/a	0.00
6	12	0.67	306.70	307.17	0.47	0.24	1.84	0.12	307.29	0.000	20.000	306.90	307.24 j	0.34**	0.24	2.83	0.12	307.37	0.000	0.000	n/a	0.00
7	24	1.42	304.50	306.58	2.00	3.14	0.45	0.00	306.58	0.004	8.000	304.50	306.58	2.00	3.14	0.45	0.00	306.58	0.004	0.000	0.000	0.67
8	8	1.28	306.30	306.97	0.67*	0.35	3.66	0.21	307.17	1.112	67.000	307.65	307.65 j	0.65	0.35	3.68	0.21	307.86	0.986	1.049	0.703	0.00
9	8	0.55	307.00	307.65	0.65	0.18	1.58	0.14	307.79	0.000	85.000	308.00	308.35 j	0.35**	0.18	2.98	0.14	308.49	0.000	0.000	n/a	0.00
10	6	0.13	306.30	306.58	0.28	0.06	1.17	0.07	306.65	0.000	24.000	306.54	306.72 j	0.18**	0.06	2.08	0.07	306.79	0.000	0.000	n/a	0.00
11	6	0.13	306.30	306.58	0.28	0.06	1.17	0.07	306.65	0.000	20.000	306.50	306.68 j	0.18**	0.06	2.08	0.07	306.75	0.000	0.000	n/a	0.00
12	6	0.33	307.00	307.65	0.50	0.20	1.70	0.05	307.69	0.355	36.000	307.36	307.76	0.40	0.17	1.97	0.06	307.82	0.365	0.360	0.130	0.00
13	6	0.33	308.00	308.35	0.35	0.12	2.30	0.12	308.47	0.000	28.000	308.28	308.57 j	0.29**	0.12	2.80	0.12	308.69	0.000	0.000	n/a	0.00
																		Number of lines: 13				
																		Run Date: 7/8/2019				

Project File: Storm Sewer_R3.stm

Notes: * Crown depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

APPENDIX D

Stormwater Quality Calculations

Water Quality Flow Calculations (Water Quality Structure WQS-1)

Residential Development

380 Tunxis Rd, West Hartford

WSE Project No. 2180652

Date: 4/22/2019

Refer to C.D.O.T. Drainage Manual Section 11.C-1

Compute Water Quality Volume:

$$WQV = \frac{(1") \times (R) \times (A)}{12}$$

WQV =	Acre-Feet	
R =	0.05 + 0.009 (I)	

I =	Impervious Area	=	0.49	=	28.7 %
	Total Area		1.71		

$$R = 0.05 + (0.009 \times I) = 0.31$$

$$A = \boxed{1.71} \text{ Acres}$$

WQV = 0.044 Acre-Feet

Compute Water Quality Flow:

1. Compute NRCS Runoff Curve Number (CN)

CN =

$$[10 + 5P + 10Q - 10 (Q^2 + 1.25QP)^{1/2}]$$

P = Design Precipitation = 1"

$$Q = 0.044 \text{ acre-feet} \times 12 \text{ in/ft} = 0.31 \text{ Watershed inches}$$

1.71 acres

CN = 89.7

Water Quality Flow Calculations (Water Quality Structure WQS-1)
Residential Development
380 Tunxis Rd, West Hartford
WSE Project No. 2180652



**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**380 Tunxis Road
West Harford , CT**

Area	1.17 ac	Unit Site Designation	WQU
Weighted C	0.43	Rainfall Station #	36
t_c	15 min		
CDS Model	2015-4	CDS Treatment Capacity	1.4 cfs

<u>Rainfall Intensity¹ (in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.08	34.3%	34.3%	0.04	0.04	32.6
0.16	21.4%	55.7%	0.08	0.08	20.0
0.24	13.3%	69.0%	0.12	0.12	12.2
0.32	8.7%	77.7%	0.16	0.16	7.8
0.40	5.1%	82.8%	0.20	0.20	4.5
0.48	2.8%	85.7%	0.24	0.24	2.4
0.56	2.6%	88.3%	0.28	0.28	2.2
0.64	1.8%	90.1%	0.32	0.32	1.5
0.72	1.2%	91.3%	0.36	0.36	1.0
0.80	1.3%	92.7%	0.40	0.40	1.0
1.00	1.7%	94.4%	0.50	0.50	1.3
2.00	3.8%	98.2%	1.01	1.01	1.8
3.00	1.1%	99.3%	1.51	1.40	0.3
4.00	0.7%	100.0%	2.01	1.40	0.1
					88.7

Removal Efficiency Adjustment² = 0.0%

Predicted % Annual Rainfall Treated = 99.7%

Predicted Net Annual Load Removal Efficiency = 88.7%

1 - Based on 14 years of 15-minute data from NCDC station 4488, Mansfield Hollow Lake, Tolland County, CT

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Water Quality Volume Calculations (Isolator Row)

Residential Development

380 Tunxis Rd, West Hartford

WSE Project No. 2180652

Date: 6/26/2019

Refer to C.D.O.T. Drainage Manual Section 11.C-1

Compute Water Quality Volume:

$$WQV = \frac{(1") \times (R) \times (A)}{12}$$

WQV =	Acre-Feet	
R =	0.05 + 0.009 (I)	

I =	% Impervious
A=	Acres

A= Acres

I =	Impervious Area	=	0.14	=	17.5 %
	Total Area		0.8		

R = $0.005 + 0.009 x$ 17.5 - 0.21

$$A = 0.8 \text{ Acres}$$

$$\text{WQV} = 0.014 \text{ Acre-Feet} = 603 \text{ cu. ft.}$$

Volume of Storage Provided (to 12" bypass invert)= *** 827** cu. ft.

* 827

* 827 cu. ft.

Pond Report

Pond No. 1 - Isolator Row

Pond Data

UG Chambers -Invert elev. = 304.50 ft, Rise x Span = 3.75 x 6.40 ft, Barrel Len = 72.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	304.50	n/a	0	0
0.38	304.88	n/a	173	173
0.75	305.25	n/a	171	343
1.13	305.63	n/a	167	511
1.50	306.00	n/a	162	672
1.88	306.38	n/a	154	827
2.25	306.75	n/a	144	971
2.63	307.13	n/a	131	1,102
3.00	307.50	n/a	114	1,216
3.38	307.88	n/a	91	1,307
3.75	308.25	n/a	51	1,357

Approximate WQV
- Provided (to invert of
12" hdpe bypass)

Culvert / Orifice Structures

Weir Structures

	[A]	[B]	[C]	[PrfRsr]		[A]	[B]	[C]	[D]
Rise (in)	= 0.00	0.00	0.00	0.00	Crest Len (ft)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00	Crest El. (ft)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0	Weir Coeff.	= 0.00	0.00	0.00	0.00
Invert El. (ft)	= 0.00	0.00	0.00	0.00	Weir Type	= ---	---	---	---
Length (ft)	= 0.00	0.00	0.00	0.00	Multi-Stage	= No	No	No	No
Slope (%)	= 0.00	0.00	0.00	n/a					
N-Value	= .000	.000	.000	n/a					
Orifice Coeff.	= 0.00	0.00	0.00	0.00	Exfil.(in/hr)	= 0.000 (by Wet area)			
Multi-Stage	= n/a	No	No	No	TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

APPENDIX E

Operation & Maintenance Plan

OPERATION AND MAINTENANCE PLAN

380 TUNXIS ROAD, WEST HARTFORD

GENERAL

This section of the plan presents the operation and maintenance plan for the erosion and sediment control measures during construction and for the proposed stormwater management system. It also provides guidelines for when the stormwater system should be cleaned and associated recordkeeping.

EROSION AND SEDIMENT CONTROL MEASURES

The erosion control measures include the following items:

- Straw bales, and Silt Fence
- Permanent Erosion Control Matting
- Temporary Sediment Basin
- Temporary Swales /Berms
- Anti-Tracking Pad
- Vegetative Stabilization
- Temporary Soil Stockpiles
- Dust Control

During construction, the Contractor will be responsible for the operation and maintenance of the erosion and control measures. During this time all erosion and sediment structures shall be maintained in proper working order. Disturbed areas shall be kept to a minimum and shall only take place where immediately required to further construction. It is desirable from an erosion prevention concern to minimize the total disturbed area at any one time. Final grading and seeding shall take place as soon as practical.

A rain gauge shall be placed at the project in a workable location and monitored during rainfall periods until all disturbed areas are stabilized. In the event there is a rainfall greater than 1/2" in a 12-hour period, all erosion control measures shall be checked and repaired as required. If no rain gauge is used, all erosion control measures shall be checked after all rainfall events. A checklist will be filled out by the contractor each week.

All soil erosion and sediment control measures shall be installed as shown on the proposed site plans. It is the intent of this plan that soil erosion measures are the first to be installed and the last to be removed. Surface waters on and adjacent to the site and abutting properties are to be protected from degradation and sedimentation. If abutting properties or street right-of way are jeopardized by construction, it shall be the owner's or contractor's responsibility to protect those properties.

Soil erosion measures shall be inspected weekly and after significant storm events. Make all necessary repairs to facilities as soon as possible. Silt fences and straw bale barriers, temporary sediment trap, and construction swales which accumulate sediment and debris shall be cleaned and re-set.

STORMWATER SYSTEMS

The proposed site plan includes the following stormwater structures:

- Catch Basins with sumps, and Drainage Manholes
- Drainage Piping
- Subgrade Detention Chamber System
- Modified Riprap Splashpad & Level Spreader

The residential homeowner's association of the Tunxis Road development will be responsible for the operation and maintenance of the stormwater structures located outside of the road right -of way. Checklists will be utilized during the inspection and cleaning process and kept on file in the maintenance office.

1. Catch Basins with sumps, Drainage Manholes (Includes Outlet Control Structure):
 - a. Catch basins and manholes shall be completely cleaned of accumulated debris and sediments at the completion of construction.
 - b. For the first year, catch basins, and manholes shall be inspected on a quarterly basis.
 - c. Any accumulated debris within the catch basins/ manholes shall be removed and any repairs as required.
 - d. From the second year onward, visual inspections shall occur twice per year, once in the spring and once in the fall, after fall cleanup of leaves has occurred.
 - e. Accumulated debris within the catch basins/ manholes shall be removed and repairs made as required.
 - f. Accumulated sediments shall be removed at which time they are within 12 inches of the invert of the outlet pipe.
 - g. Any additional maintenance required per the manufacturer's specifications shall also be completed.
2. Drainage Piping
 - a. All storm drainage piping shall be completely flushed of debris and accumulated sediment at the completion of construction.
 - b. Unless system performance indicates degradation of piping, comprehensive video inspection of storm drainage piping shall occur once every ten years.
 - c. Any additional maintenance required per the manufacturer's specifications shall also be completed.
3. Subgrade Detention Chamber System

The Subgrade Detention Systems will have an Isolator Row which is wrapped in a specified filter fabric to trap sediment and will be inspected every three months and shall be cleaned once a year at a minimum. If during inspection, it

is found that the sediment has accumulated within the Isolator Row, it shall be cleaned immediately with a jet-vac. The System's Isolator Row should be cleaned after the snow and ice removal seasons and before spring rainfall events.

5. Modified Riprap Splashpad & Level-Spreader

The Modified Riprap Splashpad & Level-Spreader will be inspected every three months and shall be cleaned once a year at a minimum. If during inspection, it is found that the sediment has accumulated within the splashpad and/or level-spreader, it shall be cleaned immediately. The splashpad and level-spreader should be cleaned after the snow and ice removal seasons and before spring rainfall events.

Disposal of Debris and Sediment:

All debris and sediment removed from the stormwater structures shall be disposed of legally. There shall be no dumping of silt or debris into or in proximity to any inland wetlands.

Maintenance Records:

The Owners(s) must maintain all records (logs, invoices, reports, data, etc.) and have them readily available for inspection at all times.

STORMWATER SYSTEM INSPECTION CHECKLIST

DATE/TIME: _____

INSPECTOR: _____

STRUCTURE	SATISFACTORY (YES OR NO)	COMMENTS CATCH BASINS/MANHOLES/OUTLET CONTROL STRUCTURE	ACTION	DATE COMPLETED
OCS-1				
CB20				
CB21				
CB22				
SUBGRADE DETENTION SYSTEM				
ISOLATOR ROW				
24" HDPE MANIFOLD PIPING				
MODIFIED RIPRAP SPLASHPAD				
OUTFALL (NORTH)				
			LEVEL-SPREADER	
OUTFALL (NORTH)				

APPENDIX F

Precipitation Data Frequency

NOAA Atlas 14, Volume 10, Version 2
Location name: West Hartford, Connecticut,
USA*
Latitude: 41.7588°, Longitude: -72.7444°
Elevation: 125.3 ft**



* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.07 (3.16-5.22)	4.91 (3.82-6.32)	6.30 (4.88-8.14)	7.45 (5.74-9.68)	9.05 (6.74-12.3)	10.3 (7.50-14.3)	11.5 (8.16-16.6)	13.0 (8.76-19.3)	15.0 (9.73-23.1)	16.5 (10.5-26.0)
10-min	2.88 (2.24-3.70)	3.48 (2.70-4.48)	4.46 (3.46-5.77)	5.28 (4.06-6.86)	6.41 (4.78-8.72)	7.27 (5.32-10.1)	8.14 (5.78-11.8)	9.22 (6.20-13.7)	10.6 (6.89-16.4)	11.7 (7.42-18.4)
15-min	2.26 (1.76-2.90)	2.73 (2.12-3.51)	3.50 (2.71-4.52)	4.14 (3.19-5.38)	5.02 (3.74-6.84)	5.70 (4.17-7.94)	6.38 (4.53-9.24)	7.23 (4.86-10.7)	8.35 (5.41-12.8)	9.20 (5.82-14.5)
30-min	1.52 (1.18-1.96)	1.84 (1.43-2.37)	2.37 (1.83-3.06)	2.80 (2.16-3.64)	3.40 (2.54-4.63)	3.86 (2.82-5.38)	4.33 (3.07-6.26)	4.90 (3.30-7.27)	5.66 (3.67-8.71)	6.24 (3.95-9.80)
60-min	0.958 (0.745-1.23)	1.16 (0.901-1.49)	1.49 (1.16-1.93)	1.77 (1.36-2.30)	2.15 (1.60-2.92)	2.44 (1.78-3.39)	2.73 (1.94-3.95)	3.09 (2.08-4.59)	3.58 (2.32-5.50)	3.94 (2.49-6.19)
2-hr	0.619 (0.484-0.790)	0.748 (0.584-0.956)	0.958 (0.746-1.23)	1.13 (0.878-1.46)	1.37 (1.03-1.86)	1.56 (1.15-2.17)	1.74 (1.25-2.53)	2.00 (1.35-2.95)	2.34 (1.52-3.58)	2.59 (1.65-4.06)
3-hr	0.476 (0.373-0.604)	0.574 (0.451-0.731)	0.737 (0.576-0.941)	0.871 (0.677-1.12)	1.06 (0.797-1.43)	1.20 (0.887-1.66)	1.34 (0.968-1.95)	1.55 (1.05-2.28)	1.82 (1.18-2.78)	2.02 (1.29-3.16)
6-hr	0.300 (0.237-0.378)	0.364 (0.287-0.460)	0.469 (0.369-0.595)	0.556 (0.435-0.710)	0.676 (0.514-0.911)	0.769 (0.573-1.06)	0.861 (0.627-1.25)	1.00 (0.679-1.47)	1.18 (0.773-1.80)	1.32 (0.844-2.06)
12-hr	0.182 (0.145-0.229)	0.224 (0.178-0.281)	0.292 (0.231-0.368)	0.348 (0.274-0.442)	0.426 (0.326-0.572)	0.486 (0.365-0.669)	0.546 (0.400-0.788)	0.637 (0.434-0.930)	0.758 (0.497-1.15)	0.850 (0.544-1.32)
24-hr	0.107 (0.086-0.133)	0.134 (0.107-0.167)	0.177 (0.141-0.222)	0.214 (0.169-0.269)	0.264 (0.203-0.353)	0.302 (0.229-0.416)	0.341 (0.252-0.493)	0.404 (0.276-0.587)	0.487 (0.320-0.736)	0.550 (0.353-0.848)
2-day	0.060 (0.048-0.074)	0.076 (0.062-0.095)	0.104 (0.083-0.129)	0.126 (0.101-0.158)	0.157 (0.122-0.210)	0.181 (0.138-0.249)	0.205 (0.154-0.299)	0.248 (0.170-0.359)	0.305 (0.201-0.459)	0.348 (0.224-0.534)
3-day	0.043 (0.035-0.053)	0.056 (0.045-0.069)	0.075 (0.061-0.094)	0.092 (0.074-0.115)	0.115 (0.090-0.153)	0.132 (0.102-0.182)	0.150 (0.113-0.218)	0.182 (0.125-0.264)	0.225 (0.149-0.338)	0.258 (0.166-0.395)
4-day	0.035 (0.028-0.043)	0.045 (0.036-0.055)	0.060 (0.049-0.075)	0.074 (0.059-0.092)	0.092 (0.072-0.122)	0.106 (0.081-0.145)	0.120 (0.091-0.174)	0.146 (0.100-0.210)	0.180 (0.119-0.270)	0.206 (0.133-0.315)
7-day	0.024 (0.019-0.029)	0.030 (0.024-0.037)	0.040 (0.032-0.049)	0.048 (0.039-0.060)	0.060 (0.047-0.079)	0.069 (0.053-0.094)	0.078 (0.059-0.112)	0.094 (0.065-0.135)	0.115 (0.076-0.172)	0.131 (0.085-0.199)
10-day	0.019 (0.016-0.023)	0.024 (0.019-0.029)	0.031 (0.025-0.038)	0.037 (0.030-0.046)	0.046 (0.036-0.060)	0.053 (0.041-0.071)	0.059 (0.045-0.084)	0.070 (0.049-0.101)	0.085 (0.057-0.127)	0.097 (0.063-0.147)
20-day	0.014 (0.011-0.017)	0.016 (0.013-0.020)	0.020 (0.017-0.025)	0.023 (0.019-0.029)	0.028 (0.022-0.036)	0.031 (0.024-0.042)	0.035 (0.026-0.049)	0.040 (0.028-0.057)	0.047 (0.031-0.070)	0.052 (0.034-0.079)
30-day	0.012 (0.010-0.014)	0.013 (0.011-0.016)	0.016 (0.013-0.019)	0.018 (0.015-0.022)	0.021 (0.017-0.027)	0.024 (0.018-0.031)	0.026 (0.019-0.036)	0.029 (0.020-0.041)	0.033 (0.022-0.049)	0.037 (0.024-0.055)
45-day	0.010 (0.008-0.012)	0.011 (0.009-0.013)	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.016 (0.013-0.021)	0.018 (0.014-0.023)	0.020 (0.015-0.027)	0.021 (0.015-0.030)	0.024 (0.016-0.035)	0.026 (0.017-0.039)
60-day	0.009 (0.007-0.010)	0.009 (0.008-0.011)	0.011 (0.009-0.013)	0.012 (0.010-0.015)	0.014 (0.011-0.017)	0.015 (0.012-0.019)	0.016 (0.012-0.022)	0.018 (0.012-0.025)	0.019 (0.013-0.028)	0.020 (0.013-0.031)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

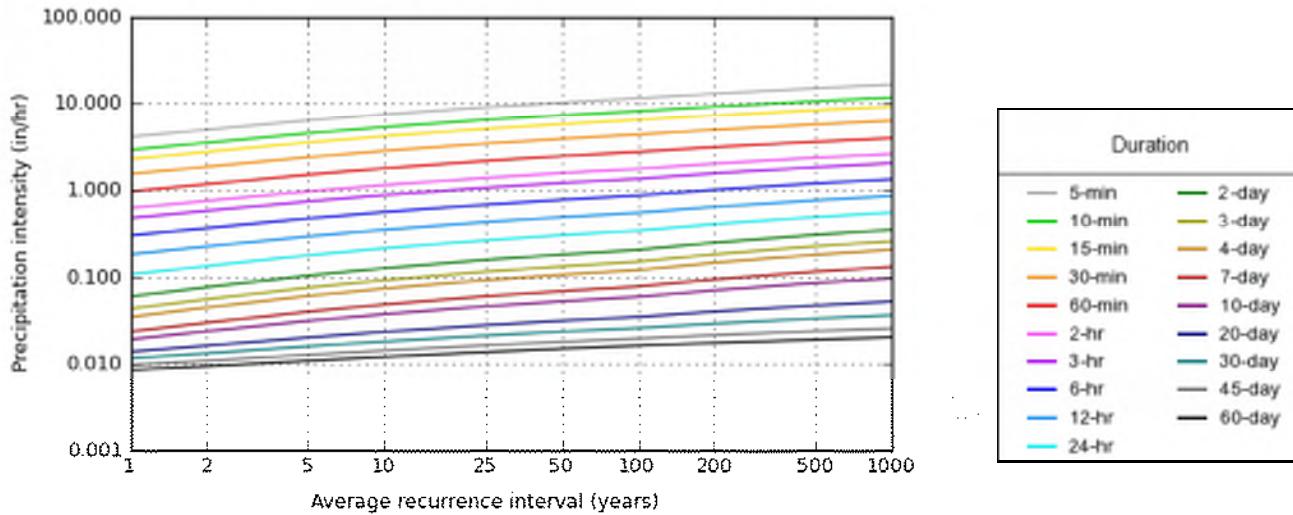
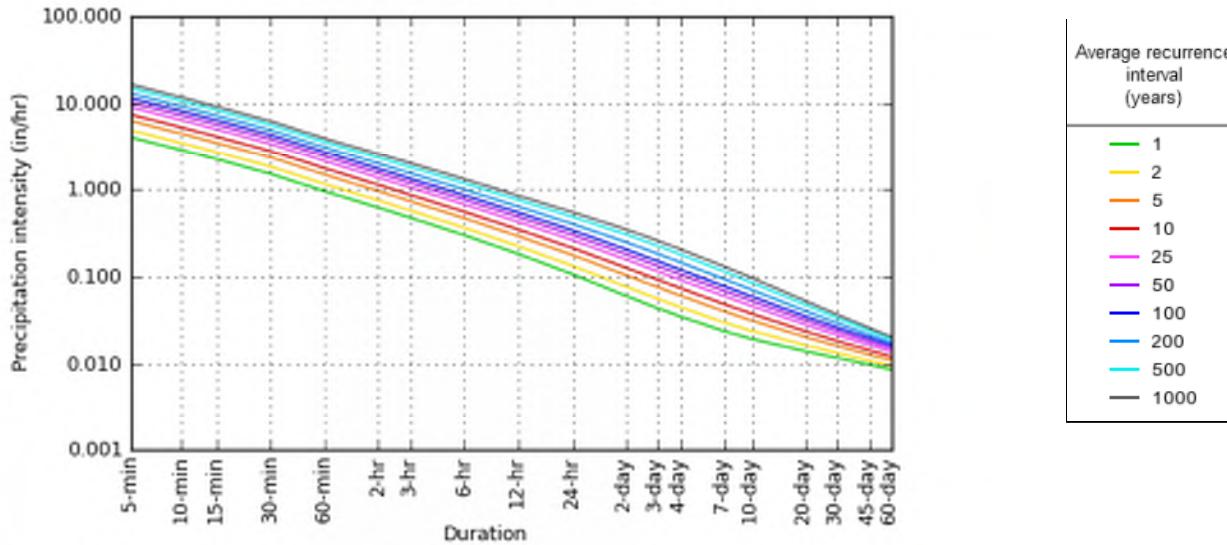
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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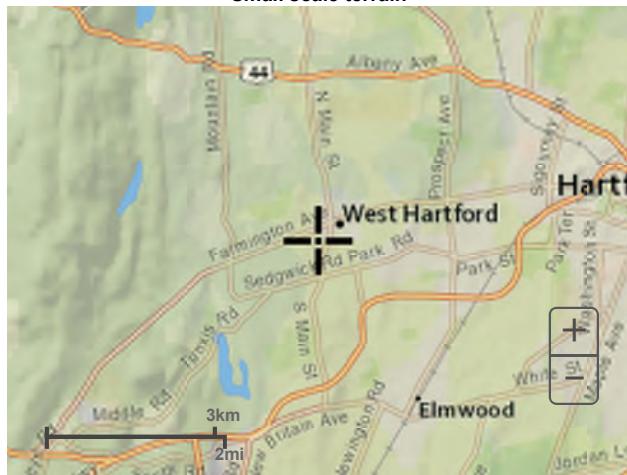
PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 41.7588°, Longitude: -72.7444°



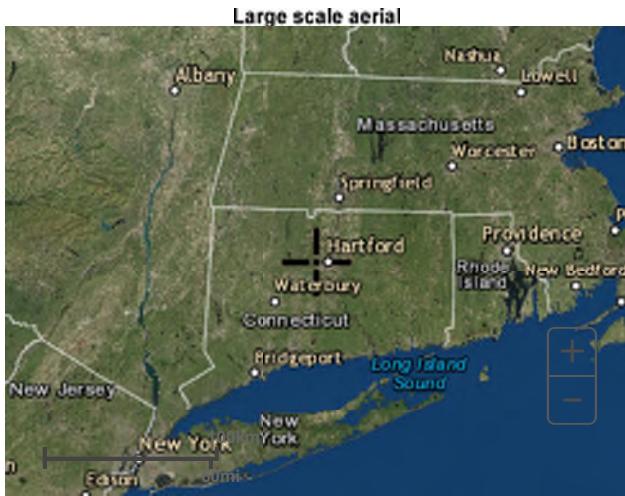
Maps & aerials

Small scale terrain



Large scale terrain





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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 10, Version 2
Location name: West Hartford, Connecticut,
USA*
Latitude: 41.7588°, Longitude: -72.7444°
Elevation: 125.3 ft**

* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.339 (0.263-0.435)	0.409 (0.318-0.527)	0.525 (0.407-0.678)	0.621 (0.478-0.807)	0.754 (0.562-1.02)	0.855 (0.625-1.19)	0.957 (0.680-1.39)	1.08 (0.730-1.61)	1.25 (0.811-1.93)	1.38 (0.873-2.17)
10-min	0.480 (0.373-0.616)	0.580 (0.450-0.746)	0.744 (0.576-0.961)	0.880 (0.677-1.14)	1.07 (0.796-1.45)	1.21 (0.886-1.69)	1.36 (0.963-1.96)	1.54 (1.03-2.28)	1.77 (1.15-2.73)	1.95 (1.24-3.07)
15-min	0.564 (0.439-0.725)	0.682 (0.530-0.878)	0.875 (0.678-1.13)	1.03 (0.797-1.35)	1.26 (0.936-1.71)	1.43 (1.04-1.99)	1.60 (1.13-2.31)	1.81 (1.22-2.68)	2.09 (1.35-3.21)	2.30 (1.46-3.61)
30-min	0.761 (0.592-0.978)	0.921 (0.716-1.19)	1.18 (0.916-1.53)	1.40 (1.08-1.82)	1.70 (1.27-2.32)	1.93 (1.41-2.69)	2.16 (1.54-3.13)	2.45 (1.65-3.63)	2.83 (1.83-4.36)	3.12 (1.97-4.90)
60-min	0.958 (0.745-1.23)	1.16 (0.901-1.49)	1.49 (1.16-1.93)	1.77 (1.36-2.30)	2.15 (1.60-2.92)	2.44 (1.78-3.39)	2.73 (1.94-3.95)	3.09 (2.08-4.59)	3.58 (2.32-5.50)	3.94 (2.49-6.19)
2-hr	1.24 (0.969-1.58)	1.50 (1.17-1.91)	1.92 (1.49-2.46)	2.27 (1.76-2.92)	2.75 (2.06-3.73)	3.12 (2.30-4.33)	3.49 (2.50-5.06)	4.00 (2.70-5.91)	4.68 (3.04-7.17)	5.19 (3.29-8.12)
3-hr	1.43 (1.12-1.82)	1.73 (1.35-2.20)	2.21 (1.73-2.83)	2.62 (2.03-3.36)	3.17 (2.39-4.29)	3.60 (2.67-5.00)	4.03 (2.91-5.84)	4.64 (3.14-6.84)	5.46 (3.56-8.35)	6.08 (3.87-9.49)
6-hr	1.79 (1.42-2.27)	2.18 (1.72-2.76)	2.81 (2.21-3.56)	3.33 (2.61-4.25)	4.05 (3.08-5.46)	4.60 (3.43-6.37)	5.16 (3.75-7.47)	5.99 (4.07-8.79)	7.09 (4.63-10.8)	7.92 (5.05-12.3)
12-hr	2.20 (1.75-2.76)	2.70 (2.15-3.39)	3.52 (2.79-4.43)	4.20 (3.30-5.33)	5.13 (3.92-6.89)	5.85 (4.39-8.07)	6.57 (4.81-9.50)	7.68 (5.23-11.2)	9.14 (5.98-13.9)	10.2 (6.55-15.9)
24-hr	2.56 (2.05-3.19)	3.21 (2.56-4.00)	4.26 (3.39-5.33)	5.13 (4.06-6.46)	6.33 (4.87-8.47)	7.25 (5.49-9.98)	8.18 (6.05-11.8)	9.69 (6.63-14.1)	11.7 (7.68-17.7)	13.2 (8.47-20.4)
2-day	2.87 (2.32-3.55)	3.67 (2.95-4.55)	4.97 (3.99-6.18)	6.05 (4.83-7.58)	7.54 (5.86-10.1)	8.69 (6.64-12.0)	9.83 (7.38-14.3)	11.9 (8.16-17.2)	14.6 (9.64-22.0)	16.7 (10.8-25.6)
3-day	3.12 (2.52-3.84)	4.00 (3.23-4.93)	5.43 (4.38-6.73)	6.62 (5.30-8.26)	8.26 (6.45-11.0)	9.53 (7.32-13.1)	10.8 (8.14-15.7)	13.1 (9.02-19.0)	16.2 (10.7-24.4)	18.6 (12.0-28.4)
4-day	3.34 (2.71-4.11)	4.28 (3.47-5.27)	5.81 (4.69-7.18)	7.07 (5.68-8.80)	8.82 (6.90-11.7)	10.2 (7.82-14.0)	11.5 (8.70-16.7)	14.0 (9.63-20.2)	17.3 (11.4-25.9)	19.8 (12.8-30.2)
7-day	3.97 (3.24-4.86)	5.02 (4.09-6.14)	6.72 (5.46-8.26)	8.13 (6.56-10.1)	10.1 (7.91-13.3)	11.6 (8.93-15.8)	13.1 (9.89-18.8)	15.8 (10.9-22.6)	19.3 (12.8-28.8)	22.0 (14.2-33.5)
10-day	4.62 (3.78-5.62)	5.71 (4.67-6.97)	7.50 (6.11-9.19)	8.99 (7.28-11.1)	11.0 (8.68-14.5)	12.6 (9.74-17.1)	14.2 (10.7-20.3)	16.9 (11.7-24.2)	20.5 (13.6-30.5)	23.2 (15.1-35.3)
20-day	6.66 (5.49-8.06)	7.81 (6.43-9.46)	9.70 (7.95-11.8)	11.3 (9.18-13.8)	13.4 (10.6-17.4)	15.1 (11.6-20.1)	16.7 (12.5-23.4)	19.3 (13.4-27.4)	22.6 (15.1-33.4)	25.1 (16.4-38.0)
30-day	8.40 (6.95-10.1)	9.58 (7.92-11.6)	11.5 (9.47-13.9)	13.1 (10.7-16.0)	15.3 (12.1-19.6)	17.0 (13.1-22.4)	18.7 (13.9-25.8)	21.0 (14.7-29.7)	24.0 (16.1-35.4)	26.3 (17.2-39.7)
45-day	10.6 (8.78-12.7)	11.8 (9.78-14.2)	13.8 (11.4-16.6)	15.4 (12.7-18.7)	17.7 (14.0-22.5)	19.5 (15.0-25.4)	21.2 (15.7-28.8)	23.2 (16.3-32.7)	25.8 (17.4-37.9)	27.8 (18.2-41.9)
60-day	12.4 (10.3-14.8)	13.6 (11.3-16.3)	15.7 (13.0-18.9)	17.4 (14.4-21.1)	19.8 (15.7-25.0)	21.6 (16.7-28.0)	23.5 (17.3-31.5)	25.2 (17.8-35.4)	27.5 (18.5-40.3)	29.2 (19.1-44.0)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

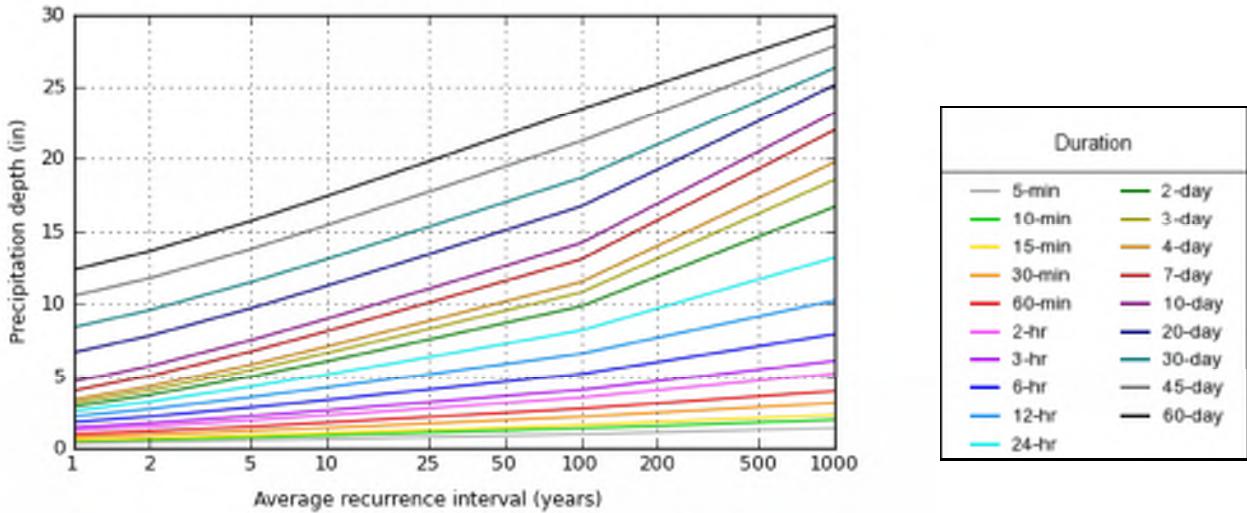
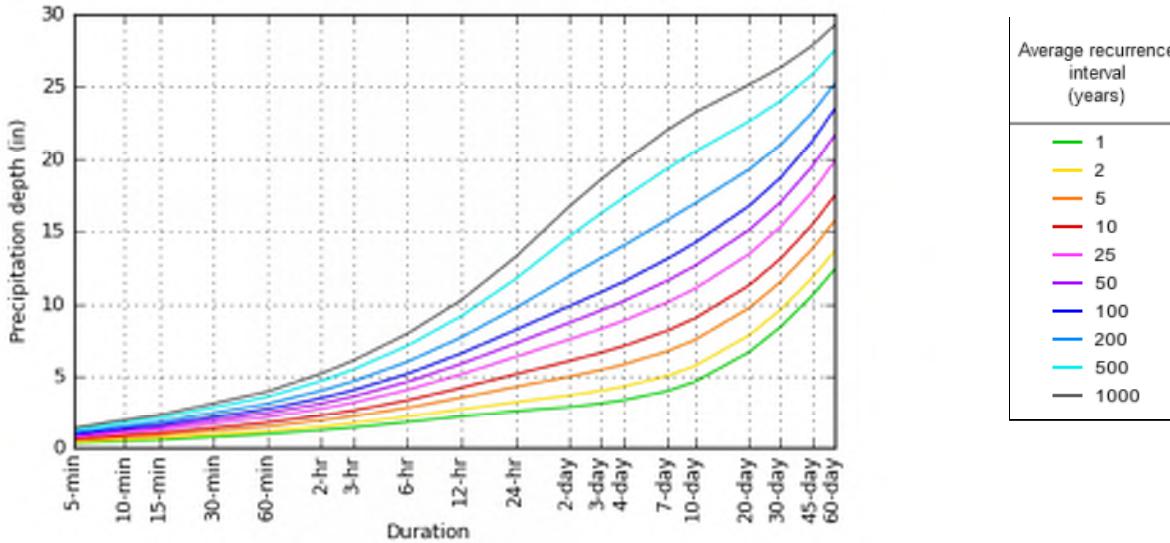
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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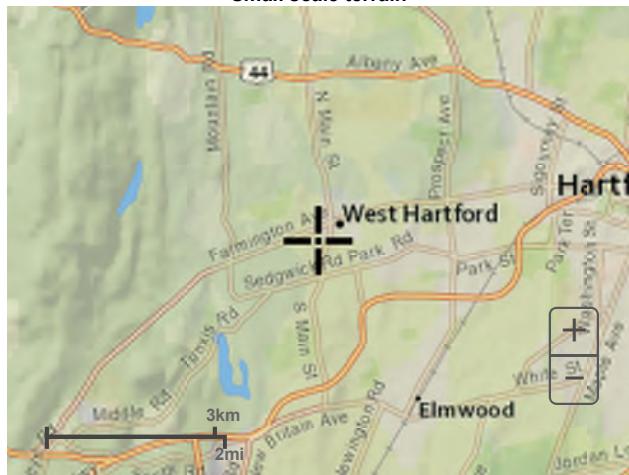
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 41.7588°, Longitude: -72.7444°



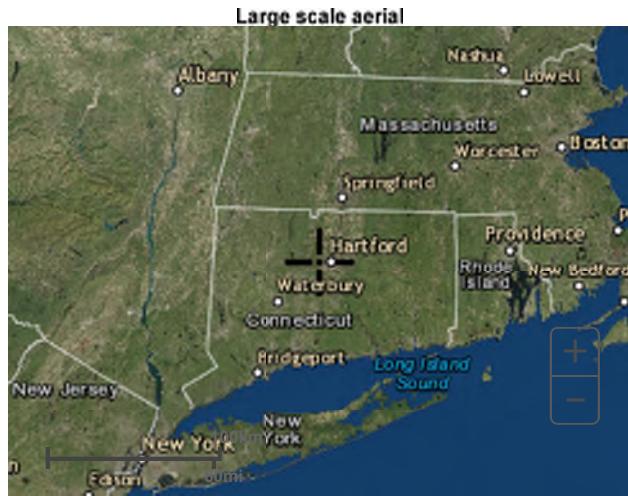
Maps & aerials

Small scale terrain



Large scale terrain





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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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APPENDIX G

Test Pit Data

WELTI GEOTECHNICAL, P.C.

GEOTECHNICAL ENGINEERING

227 Williams Street · P.O. Box 397
Glastonbury, CT 06033-0397

(860) 633-4623 / FAX (860) 657-2514

April 10, 2019

Mr. Alan Bongiovanni, L. S.
The Bongiovanni Group, Inc.
170 Pane Road
Newington, CT 06111

Re: Proposed Residential Subdivision, 380 Middle Road, West Hartford, CT

Dear Alan:

Pursuant to your request a visit was made to the above site on April 4, 2019 to observe six test pits. The logs and a location plan for the test pits are attached herewith.

The natural inorganic soils on the site are from glacial moraine deposits. These deposits consist generally of medium compact to dense fine to coarse sand and silt with little gravel. The groundwater, where evident in the test pits was at 4 to 5 feet below the existing grades.

Grain size gradation tests and laboratory permeability tests were performed on 2 soil samples taken from test pits TP#1 and TP#2. These two test pits were located in the area of a proposed storm water detention/infiltration system. The results of the grain size gradation are attached herewith. The results of the laboratory falling head permeability tests performed on the soil samples are as follows.

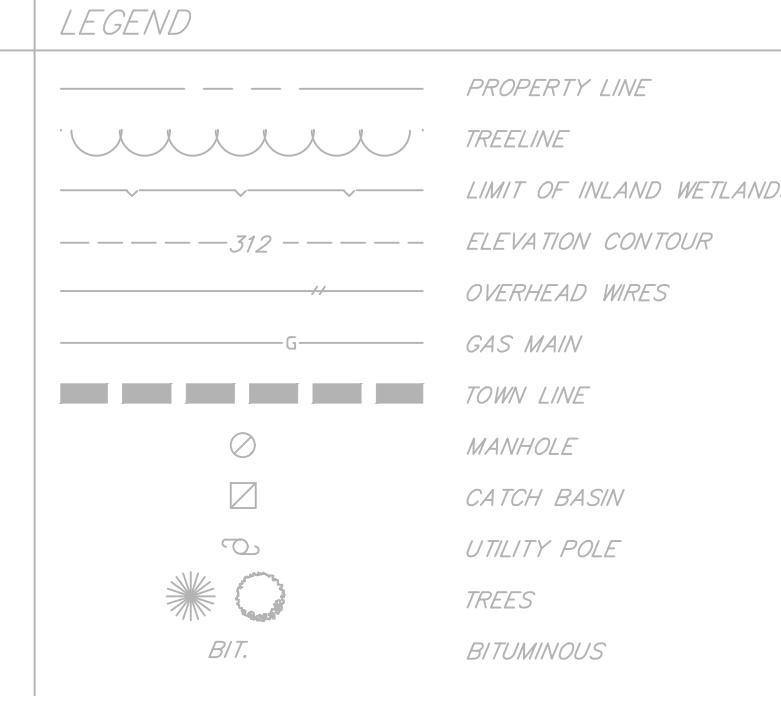
Sample #	Permeability (feet/day)
TP#1 @ 5'	1.7
TP#2 @ 5'	2.9

If you have any questions, please call me.

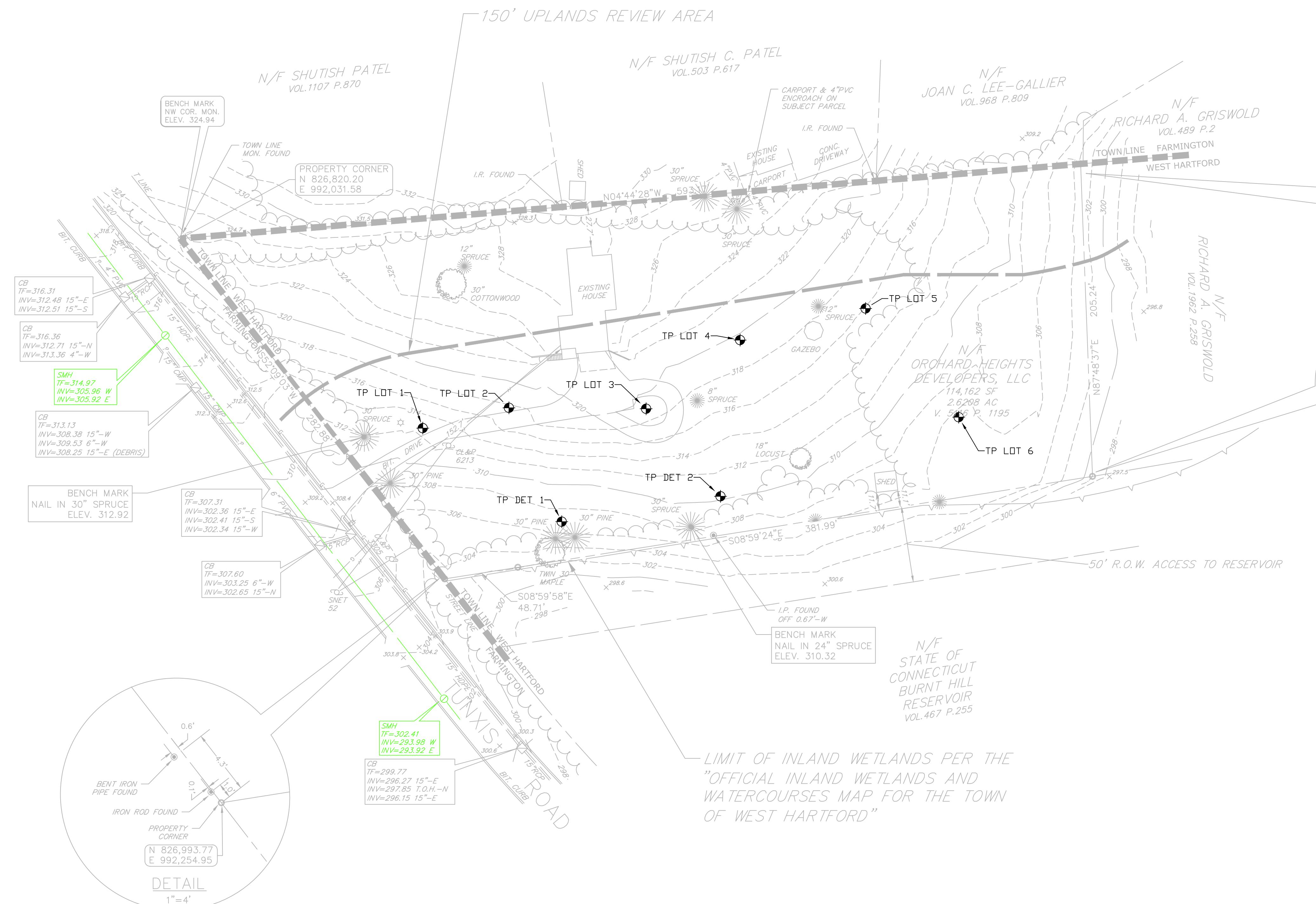
Very truly yours,



Max Welti, P. E.



NAD83



**LIMIT OF INLAND WETLANDS PER THE
"OFFICIAL INLAND WETLANDS AND
WATERCOURSES MAP FOR THE TOWN
OF WEST HARTFORD"**

REFERENCE MAPS:

- "BOUNDARY SURVEY, MAP OF C.R. CASTALDI, 414 TUNXIS ROAD, WEST HARTFORD, CONN.", DATE: 3-23-88, SCALE: 1"=40', REVISED THROUGH 5-3-88, BY BGI, THE BONGIOVANNI GROUP, INC.

"FINAL PLOT PLAN BURNT HILL, PREPARED FOR NEWELL STAMM, BURNT HILL ROAD, FARMINGTON, CONN., SCALE 1"=40', DATE JUNE 30, 1983, ALFORD ASSOCIATES, INC."

"TOWN OF FARMINGTON, HIGHWAY MAP, MIDDLE ROAD, FROM OLD SOUTH ROAD EASTERLY TO WEST HARTFORD, SCALE 1"=40', DATE JAN. 1940, SHEETS 3 & 4

NOTES:

- THIS SURVEY HAS BEEN PREPARED PURSUANT TO THE REGULATIONS OF CONNECTICUT STATE AGENCIES SECTIONS 20-300b-1 THROUGH 20-300b-20 AND THE "STANDARDS FOR SURVEYS AND MAPS IN THE STATE OF CONNECTICUT" AS ADOPTED BY THE CONNECTICUT ASSOCIATION OF LAND SURVEYORS, INC. ON SEPTEMBER 26, 1996:

TYPE OF SURVEY: PROPERTY SURVEY

BOUNDARY DETERMINATION CATEGORY: RESURVEY

CLASS OF HORIZONTAL ACCURACY 1-3

CLASS OF VERTICAL ACCURACY: V-2

**CLASS OF BOUNDARY ACCURACY: T-2
CLASS OF TOPOGRAPHIC ACCURACY: T-2
SURFACE UTILITY ACCURACY: T-2**

UNDERGROUND UTILITY ACCURACY: D (COMPILED)

INTENDED USE: EXISTING CONDITIONS

HORIZONTAL DATUM IS BASED ON NAD'83.

ELEVATIONS ARE BASED ON NAVD'88

THIS MAP IS VALID ONLY IF IT BEARS THE ORIGINATING STAMP

EMBOSSED SEAL OF THE UNDERSIGNED LAND SURVEYOR.

MY KNOWLEDGE AND BELIEF. THIS MAP IS SUBSTANTIALLY

OTED HEREON.

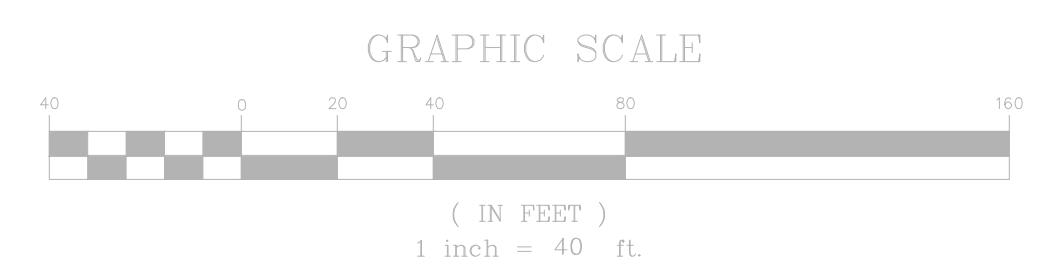
SURVEYOR'S SIGNATURE DATE LICENSE NUMBER

Digitized by srujanika@gmail.com

THIS DRAWING HAS BEEN PREPARED BASED, IN PART, ON INFORMATION PROVIDED BY OTHERS RELATING TO THE LOCATION OF UNDERGROUND SERVICES. WE CAN NOT VERIFY THE ACCURACY OF THIS INFORMATION AND SHALL NOT BE HELD RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY BE INCORPORATED HEREIN AS A RESULT.

INDICATED UNDERGROUND UTILITIES ARE BASED ON AVAILABLE DATA. THE LOCATIONS ARE APPROXIMATE AND ALL UTILITIES MAY NOT BE SHOWN.

CALL "CALL B-4-U DIG" AT 1-800-922-4455 PRIOR TO ANY EXCAVATION.



PROPERTY SURVEY

<i>Sheet</i>	2	12
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87306

Proposed Residential Development
 380 Middle Road
 West Hartford, CT

Test Pits taken 4/4/19
 M. Welti

Test Pit #	topsoil & subsoils	moraine	groundwater depth below grade
TP#1	24"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	none
TP#2	18"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 7'	none soils saturated @ 5.0'
Lot#1	12"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	none
Lot#2	18"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	groundwater seepage @ 5.0'
Lot#3	12"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	none
Lot#4	12"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	groundwater seepage @ 4.0'
Lot#5	18"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	groundwater seepage @ 5.0'
Lot#6	18"	fine to medium SAND, some Silt, little Gravel bottom of test pit @ 6'	none

Particle Size Distribution Report

